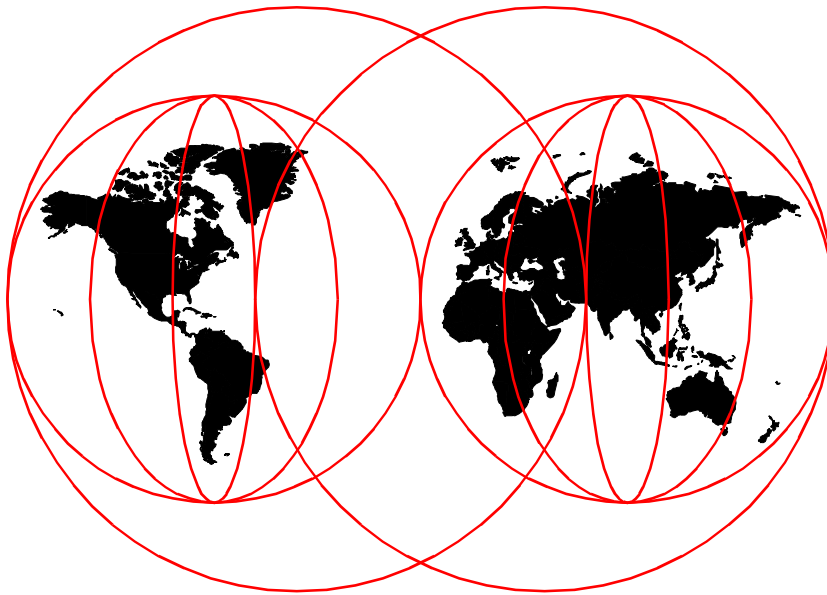


Lotus Domino R5 on OS/2 Platform Exploring New Features and Interoperability

Jose Carlos Faisca, Anssi Nummi, Tsutomu Oya



International Technical Support Organization

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International Technical Support Organization

**Lotus Domino R5 on OS/2 Platform
Exploring New Features and Interoperability**

December 1999

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix F, "Special notices" on page 317.

First Edition (December 1999)

This edition is based on Lotus Domino R5 (Releases 5.0.1a and 5.0.2) on OS/2, OS/2 Warp Server V4, OS/2 Warp Server for e-business, and OS/2 Warp 4. We recommend that you consult the product documentation or follow-on versions of this redbook for more current information.

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Preface

This redbook covers important changes introduced with the latest Domino release. It describes the new features of Domino R5 and provides guidance to help you install and administer Domino R5 using the Windows Administrator Client, the WebMail Client, and existing R4 clients. The new WebMail Client, also known as the Notes browser client, is a new method for Notes users to access mail and calendar features and is discussed in detail.

Domino administrators will appreciate the sections on how and when to use the administrative methods, how to install new servers, how to migrate existing servers, and how to tune Domino R5 and the WebMail Client for optimal performance. Current and new Notes users will find the section on the new WebMail Client well worth reading.

The team that wrote this redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization, Austin Center.

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Chapter 1. Introduction

Throughout this document, two releases of Domino R5 are discussed:

- Domino R5.0.1a

This release, which is certified for OS/2 Warp Server V4, is the first Domino R5 server release on OS/2 and became available in August 1999. Installed on OS/2 Warp Server V4, up to 1800 clients for each server were tested successfully.

- Domino R5.0.2

This release is certified for OS/2 Warp Server for e-business with a general availability date of November 1999.

This new version supports databases greater than 2 GB on OS/2 Warp Server for e-business and facilitates the creation of databases up to 64 GB. It utilizes memory above 512 MB (High Memory) to improve server capacity, which results in up to 2045 clients per server.

The more clients, the more powerful the system must be

Powerful servers are required to support a high number of clients. In general, the more clients a server must serve, the more powerful the server system must be. Performance-wise, it pays to invest in fast SMP machines.

In this document, Domino R5 always refers to both releases.

Lotus Domino R5 for OS/2 provides Domino server functions for an OS/2 environment. As with Domino R5 servers on other platforms, Domino R5 for OS/2 provides Internet-aware functions, better performance, and support for a large number of users.

However, an OS/2 Notes R5 Client, equivalent to a Notes R5 Client for Windows, will not be released. There are several reasons for this. First, even if you are using Notes R4.x workstation, you never lose any functionality of Notes R4.x Client, and you can even get performance benefits from Domino R5 server for OS/2. Basically, Notes R4.x Clients work with Domino R5 for OS/2 perfectly well when not using R5 templates. Second, the trend of IT technology is moving toward thin client computing, or, in other words, an e-business application model. This means the browser client (thin client) has more focus than the Notes workstation client (fat client).

As long as a Notes R4.x Client accesses mail or databases on a Domino R5 server that has a R4.x compatible template, the Notes R4.x Client works fine

with R4 mail and database files and can even gain performance benefits from the newly updated On Disk Structure (ODS). For more information on the Domino R5 new database or storage format, refer to 5.3.5, "On Disk Structure 41" on page 158.

Accessing the Domino R5 server for OS/2 from the Internet using the new WebMail client is enhanced over the previous Domino R4.6 browser client. The WebMail client takes advantage of R5's new features and performance improvements. However, its usage still has few restrictions. For example, without Domino Runtime Services (DRS) the WebMail client cannot have a local copy of the database and, therefore, increases network traffic.

Lotus has announced Domino Runtime Services (DRS), which is meant to enhance the Notes browser client to support more administrative functions, mail functions, and local database and application replicas. This dramatically increases laptop usage. The target date for the OS/2 implementation of DRS is the second quarter of 2000. DRS may be a successor of Notes R4.x for those who want to have a thin version of Notes Client and will enhance the current Web browser client functionality.

1.1 Domino R5 administration

Many of the administrative tasks can be performed by using a Web browser and Notes R4 Administration as described in Chapter 7, "Administering the OS/2 Domino R5 server: Part 1" on page 223 and Chapter 8, "Administering the OS/2 Domino R5 server: Part 2" on page 253.

A Notes R4 Client provides limited administration functions for Domino R5 server management. Obviously, you need to have an administrator ID, such as the administration user.id of the server.

Alternatively, administrative tasks can be performed using the Web browser interface, or they can install the Domino R5 Administrator client for Windows. To administrate Domino R5's new features, a Domino R5 Administrator for Windows client is mandatory (for example, LDAP administration or R5 new user registrations).

As mentioned previously, R5.0.1a is the first release of Domino R5 for OS/2. This version is certified to run on OS/2 Warp Server V4 (Entry, Advanced, and SMP). The certified version for OS/2 Warp Server for e-business is Domino R5.0.2.

1.2 Licenses

Domino R5 for OS/2 is available with the following licenses:

- **Domino Application Server**

The Domino Application Server is for customers who want to use Domino for collaborative intranet and Internet applications in addition to mail. Also included is the new TeamRoom template, a powerful tool that helps customers quickly create applications for information sharing and collaboration, and Domino Enterprise Connection Services, for easy, non-programmatic access to backend datasources such as relational databases. The Domino Application Server supports systems with up to four CPUs. The Domino Application Server license also includes the new Lotus QuickPlace and IBM WebSphere.

- **Domino Mail Server**

The Domino Mail Server is for customers who want the industry-leading solution that offers messaging, group calendaring and scheduling, document libraries, and discussion databases. The Domino Mail Server supports systems with up to four CPUs and is the perfect solution for customers who want to get started quickly with a robust, easy to use and manage messaging solution.

- **Domino Enterprise Server**

The Domino Enterprise Server builds on the functionality of the Domino Mail and Application Servers and is targeted at customers needing unmatched performance and 24x7 (24 hours a day, 7 days a week) levels of reliability for messaging or collaborative applications. The Domino Enterprise Server supports systems beyond four CPUs to take advantage of increased platform horsepower. Clustering services for failover and load balancing for both Notes Clients and Web browsers are included with the Domino Enterprise Server. Customers who choose the Domino Enterprise Server may install more than one Domino server on a single physical machine using the partitioning technique, thereby leveraging the power of their symmetrical multiprocessing server systems.

1.3 Domino R5: New features

With Release 5, Domino brings Internet integration to a new level. For example, there is now native support for MIME and SMTP standards. Domino's own Web engine has also been enhanced. In the past few years, we have seen that the Web has become more and more important as a communication channel in both business and consumer settings. As a result,

in some applications, interruptions in service are unacceptable. To minimize these, Domino R5 supports Web clients in clustered environments, making high availability and workload balancing a reality.

These features and many others make Domino an even more attractive solution for many customer applications.

1.4 New features in the Domino R5 server

Table 1 highlights the most significant new features found in the R5 Domino server and gives a brief explanation for each of them.

Note

Some of the features introduced here are not enabled by default, or require the use of Domino Administrator R5 for Windows.

Table 1. New features in the Domino R5 server

New feature	Function
Internet mail	
Native Internet addressing	Domino server currently recognizes and fully supports Internet addressing rules. This allows consistent user naming for both Notes and Internet users. This also means that there is no need for address conversions, which, in turn, improves mail routing functions.
Native MIME support	MIME is the message format used for Internet mail to support content other than plain text. Notes mail now supports MIME directly, which means no conversion is required when interchanging mail across the Internet. Notes also supports S/MIME, the secure version of MIME.
Native SMTP routing	Native Simple Mail Transfer Protocol (SMTP) routing means that every Domino server in your enterprise is capable of Internet mail routing without any add-on Mail Transfer Agent (MTA) tasks. This both simplifies configuration and improves mail routing performance since there is no conversion overhead.
Security	
Fully integrated X.509 certificates	Domino allows administrators to register new users with traditional Notes certificates or with X.509 v3 certificates.
Stronger cryptography	Domino now supports stronger RSA keys and RC2 keys for North America.

New feature	Function
Common Data Security Architecture (CDSA)	CDSA enables application developers to add security features to Domino applications.
S/MIME	Support for secure Internet mail delivery using encryption and digital signatures.
SSL v3	Support for SSL protocol for clients using LDAP or IIOP.
Forgotten password recovery	Domino R5 introduces recovery agents that log both password and ID changes, enabling easy password and ID file recovery.
APIs for customizing authentication	New Domino Web server APIs for Web application developers.
Authentication through third-party directory	Enables authentication using third-party LDAP server.
Password quality testing	Administrators can define rules governing password construction, such as the minimum password length, case sensitivity requirements, and use of both numeric and alphabetical characters in the password. This can greatly improve password security in your enterprise.
Directories	
Domino Directory	Domino Directory is equivalent to the Public Address Book in earlier releases of Domino.
Directory Catalog	This catalog is a highly compressed and scalable concatenation of the Domino Directories in the enterprise.
Directory Assistant	Directory Assistant is equivalent to the Master Address Book.
LDAP v3	Domino now supports both LDAP v2 and v3. LDAP is an open standard which Lotus uses to allow Domino server to act as a centralized directory server for any LDAP-enabled client.
Messaging	
Message tracking and monitoring	This allows you to track mail messages using sender, recipient, date, message subject, and/or message size. The information that passes the defined filter is collected and placed in the MailTracker Store database on each mail server.
Message store management	Administrator now has better tools to control the disk space used per user.

New feature	Function
Routing control management	There are several improvements over the previous release of Domino to better control mail routing and junk e-mail. The new features enable you to allow or disallow mail from defined domains, set the maximum message size, set the message priority, and set other filters for unwanted mail.
Upgrade tools *	Domino server provides built-in tools to easily upgrade from: • cc:Mail • MS Mail • Windows NT and MS Exchange These allow the administrator in your enterprise to migrate your users to Domino R5 using the existing user directory, thus avoiding the laborious process of re-entering the user information.
Message reporting	Gives you detailed information on mail statistics, routing changes, and mail performance.
Web application server	
Enhanced HTTP stack	The Domino HTTP engine has been improved, both in performance and support for Java.
Support for Internet Information Server *	You now have the choice to either use Domino's native HTTP engine or Microsoft's Internet Information Server (IIS) for Web client connectivity.
Access control for HTML files	ACLs are extended to HTML files as well.
API for customizing authentication	New API functions for application developers.
Internet Cluster Manager (ICM)	Web clients can now benefit from robust Domino clustering and high availability features. The ICM is a new layer to handle browser client requests to the Domino databases. The ICM forwards requests to the least busy server in the cluster. This and other aspects of Domino clustering are discussed in the book <i>Netfinity and Domino R5.0 Integration Guide</i> , SG24-5313.
Browser capabilities	Formula language allows interrogation of the user's browser capabilities, such as support for JavaScript, so that applications can tailor their operation to the specific browser being used.

New feature	Function
Live access to relational databases	Support for real-time access to several relational databases. This enables application developers to use Domino as middleware between the client and back-end information storage.
Virtual server logging	Gives better analysis tools for multi-homed Web servers. You can also define how long the log file is used: a day, a week, or a month.
Virtual server SSL support	Support for multi-homed secure Web sites on one Domino server.
Web server extension API	Allows application developers to customize the Domino Web server.
Byte range serving	This feature allows the Web client to download a file by requesting a byte range instead of the whole file. If a disconnect occurs during a download, the operation can resume from the point it was interrupted when the connection is restored.
Caching enhancements for browser clients	Performance improvements may be gained by allowing Domino-generated Web pages to be cached by browsers.
CORBA/IIOP protocol support	Domino R5 supports Common Object Request Broker Architecture (CORBA) and Internet Inter-ORB Protocol (IIOP).
Application server	
Database storage increased	The previous maximum database size of 2 GB has been extended to 64 GB (at the time of writing this was the largest database that has been tested, not an architectural limit). This greatly improves scalability.
Memory and I/O optimization	Performance is a key focus area in the design of Domino R5. Several improvements to support more mail and database users on a single server have been introduced. These include: • Compression • Sequential I/O • A single buffer manager • Background I/O threads with read-ahead
High Memory support	With OS/2 Domino Release 5.02 server, the NSFBufferPool will utilize OS/2 High Memory support if this support is available. More detailed information on this can be found in 5.3.2, "High Memory support" on page 154.

New feature	Function
Transaction logging	Transaction logging provides better data integrity in case of a server failure. When logging is active, every transaction is first written to a sequential file and later propagated to the database file. In addition, transactional logging significantly improves server performance. Transactional logging also enables incremental database backup and faster system restart times after failures.
Database fixup enhancement	After a failure, fewer Domino R5 databases have to be fixed up prior to the system restart, improving server availability.
Improved scalability	As well as supporting much larger databases, Domino R5 supports many more concurrent users than R4 running on similar hardware.
Global database routing	If a database is not available on one server, global database routing redirects the request to the closest replica copy of the database.
High availability and scalability	
Internet Cluster Manager	Web clients can now benefit from Domino failover and workload balancing features. This feature is discussed in detail in the book <i>Netfinity and Domino R5.0 Integration Guide</i> , SG24-5313.
Domino clustering enhancements	Domino clustering functions have been improved over Domino R4. This includes: • Collaborative calendaring • Synchronous mail agent failover • Improved unread mark support of replicas • Better failback functionality for the Notes Client
Online indexing	Allows access to database views that are currently being updated.
Auto restart enhancements	You can optionally keep the Domino server down after failures. This can be very useful in clustered configurations.
Fast restart and recovery	If the Domino R5 server fails, the server will automatically restart itself without performing a full initial startup.
Online, in-place compaction	You can now compact a database while it is in use.
Online backup support	Domino R5 introduces API commands to enable online incremental or full backups. This improves availability and allows third-party vendors to develop better backup solutions for Domino.

New feature	Function
Administration	
Upgrading users at registration	Lotus provides integrated tools to migrate user registration information from your existing messaging system such as cc:Mail or Microsoft Exchange.
Server setup	The new server installation procedure enables you to install a Domino server without installing the Notes Client.
Automated client setup	The new installation method lets you create custom packages for automated install. This greatly decreases the cost of administration.
Enhanced server setup profiles	Allows you to create profiles for automated server installs.
Administration Process (AdminP)	
Programmability	Lotus has published a set of API calls to customize the Administration Process. This allows third-party vendors to provide customized administration tools for Domino server.
Cross-domain functionality	Administration process services are now also available cross-domain, allowing you to administer all the servers in your enterprise centrally.
New administration interface*	Notes Client ships with the new administration application that lets you administer your Domino server faster and easier.
Third-party integration options	Lotus has published a set of APIs, enabling third-party vendors to enhance the administration utility.
Desktop management	
Centralized client management	You can customize client settings centrally, for example, setting proxy servers, bookmarks, and preferences.
Centralized upgrades	This feature allows you to push software upgrades to clients using e-mail.
Telnet into server console	You can administer the Domino server console from any workstation or server supporting the Telnet protocol.
Batch console commands	You can run, for example, a set of replication events directly from the server console by executing a single batch file.
Decommission server analysis tool	Simplifies consolidation of servers by comparing source and target systems when migrating Domino between platforms.
Knowledge management	

New feature	Function
Domain search	This feature allows users to automatically search all databases within a domain. ACLs are incorporated into the search to ensure that only documents to which the user has the required access privileges are returned.
Universal filters	Domino R5 supports indexing and searching of attachments. The supported formats are: • Lotus WordPro • Lotus 1-2-3 • Lotus Freelance • Adobe PDF • WordPerfect • MS Word • MS Excel • MS Powerpoint • Ichitaro • HTML
Paged result set	The search results page may be customized and uses the common Internet search engine result page format.
Full-text Service Provider Interface (SPI)	Lotus provides APIs to allow third-party search engines to interrogate Domino databases.
Full-text indexing of file system	A single search finds the documents from both the Domino databases and the file system. This applies to the Web server only.
Domain Catalog	The central way of keeping track of database attributes (like the location of the closest replica of a database) to simplify knowledge management.
*Note: Not applicable to Domino R5 for OS/2.	

1.5 OS/2 server environment

For your convenience, this section provides a brief summary of each OS/2 Warp Server product family. "Related publications" on page 321 lists redbooks about the OS/2 server family.

1.5.1 OS/2 Warp Server V4 Entry

This version of OS/2 Warp Server is known as *Entry*. If you need to support just a small number of users, this operating system should be suitable. If you work in a larger environment, you should use the *Advanced* version of OS/2 Warp Server. File systems available in this release are FAT and HPFS. As for

Domino R5, we cannot really recommend this server operating system release; however, the Domino R4.6 server, as well as the Domino R5, are certified to run on this server version.

1.5.2 OS/2 Warp Server V4 - Advanced

This version of OS/2 Warp Server is very powerful and supports a large number of clients. Among other features, the HPFS386 file system is available for this server. This file system works closely with the operating systems' ring 0 and provides high performance as a file server.

The Domino R4.6 server, as well as the Domino R5, are certified to run on this server version.

1.5.3 OS/2 Warp Server V4 - Advanced SMP

This version of OS/2 Warp Server V4 - Advanced supports multiple Symmetric Processors (SMP). This enhancement provides great performance for processor-intensive applications and extensive file I/O.

The Domino R4.6 server, as well as the Domino R5, are certified to run on this server version.

1.5.4 OS/2 Warp Server for e-business

This latest version of the Warp Server family product provides powerful and scalable performance as a file server and an application server. HPFS386 provides good performance, but it is not scalable. Journaled File System (JFS) provides scalable performance in an SMP environment.

JFS is specifically targeted for large application servers missions, employing IBM application middleware, such as Lotus Domino server, DB/2, and Web application server. Performance of these application servers is comparable to earlier HPFS386-base Warp Servers, while providing increased scalability when installed on an SMP server.

With the increase in disk and disk array size comes a need for larger partitions and files. JFS greatly expands the capacity limits inherent in earlier file systems on OS/2, while improving the recoverability of the system in case of server failure. In combination with the new Logical Volume Manager (LVM) feature, JFS also supports partitions that span physical volumes.

The previous limit for OS/2 disk partitions was 64 GB, causing some customers to arbitrarily partition large disk arrays. JFS supports partitions up

to 2 TB and dynamic expansion, allowing tremendous flexibility in data storage and management.

In cases of system and/or hard drive failures, JFS file system recovery time is significantly improved over HPFS386. While large HPFS386 partitions may require hours to recover, the JFS recovery time has been reduced to a few minutes by simply playing back its transaction log or journal to restore the file system.

The traditional HPFS386 file system continues to provide world-class file and print performance for large enterprise environments and is available separately from the base product.

Previously, SMP support for up to four processors was provided in an OS/2 Warp Server V4 - Advanced SMP. Now, OS/2 Warp Server for e-business supports up to 64 SMP configuration.

OS/2 Warp Server for e-business provides a proven mission-critical foundation for the transformation to the Network Computing and e-business environments, while supporting legacy applications and integrating OS/2 more tightly into the IBM family of business servers. JFS provides a state-of-the-art, quickly recoverable, transaction-oriented, log-based, scalable file system. The increased performance from scalability and the enhanced reliability that JFS provides make OS/2 Warp Server for e-business better suited than ever for Web and Domino serving.

Domino server Release 5.0.2 is certified to run on this server.

1.5.5 WorkSpace On-Demand 2.0

WorkSpace On-Demand (WSOD) 2.0 provides enhanced remote boot capability to the OS/2 Warp family. This release can remotely serve DOS, Windows, and OS/2 Warp 4-based systems.

In addition to IEEE802.2 remote boot protocol, DHCP boot sequence is also supported on this product to adapt to a Web-based application environment.

When implementing this product, you have a suitable Network Computing environment for Lotus Notes R4.5x clients on OS/2 Warp 4 in combination with Domino R5 server on OS/2 Warp Server families.

For information about how to install a Notes workstation on a WorkSpace On-Demand server, see Appendix E, "Enabling Lotus Notes on WorkSpace On-Demand 2.0" on page 309.

For more information, see:

- *WorkSpace On-Demand Handbook Release 2.0*, SG24-5117
- *WorkSpace On-Demand Early Customer Experiences*, SG24-5107

1.5.6 WorkSpace On-Demand 2.0 feature for Windows clients

IBM released a new feature for WorkSpace On-Demand 2.0. This feature provides a remote installation and management environment of Microsoft Windows 95/98/NT from OS/2 Warp Server families.

Using this feature, you can deploy Domino Administrator and Notes workstation on the Microsoft Windows operating systems mentioned above.

Data directory support for WSOD Win32 clients

Domino R5.0.2 supports Win32 client data directories on an OS/2 network drive. This allows WSOD Win32 clients to talk to a Domino 5 server.

For more information, see *WorkSpace On-Demand 2.0 Feature for Windows Clients*, SG24-5396.

1.6 Other Lotus Notes/Domino components for Windows

The Notes Client for Windows has been divided into four packages to separate different functions. These functions are client/server administration, application development, and a new mail notification utility called Lotus Minder. Notes R5 Client is not released for OS/2 platforms. However, it is a good idea to know what the Notes R5 Client is, and what other enhanced client components do.

Each component can be installed independently of the others. Therefore, if a user needs to send and read mail, access Domino databases, and manage Domino servers, but is not involved in application development, only the Lotus Notes and Lotus Domino Administrator components need to be installed. This saves disk space.

Domino server can also be installed without the Notes Client. This provides added security, since no one can then access Notes databases locally.

1.6.1 New features in the R5 Notes Client for Windows

As described in the above section, the number of Domino server enhancements and innovations are significant. Looking at the new features in

the R5 Notes Clients (shown in Table 2), we see that some are common to both the client and server. These are listed here again for ease of reference.

Table 2. New features in the R5 Notes Client

New feature	Function
General features	
Notes Client user interface	The Notes Client user interface has been completely redesigned. The new interface integrates regular Notes Client function and access to the Web better than ever before. Calendar now allows more than one calendar to be open at once, and navigation between windows is easier and faster thanks to the Navigation bar and Headlines page.
Separate server and client components	You can now install a Domino server without installing a Notes Client. This enables better security and frees up server resources. Three different clients are available for optional installation: the standard Notes Client, the Lotus Domino Administrator, and the Lotus Domino Designer.
Domino Directory	Domino Directory is equivalent to the Public Address Book in earlier releases of Domino.
Directory Catalog	This catalog is a highly compressed and scalable concatenation of the Domino Directories in the enterprise.
Directory Assistant	Directory Assistant is equivalent to the Master Address Book.
Interoperability features	
POP3 and IMAP4 support	The Notes Client is a full-capacity POP3 and IMAP4 client. Notes can be used to fetch and send Internet mail messages from any standard Internet mail server. The Notes Client can also be used in place of other mail clients, even if the user has more than one Internet mail account.
Native MIME support	MIME is the message format used for Internet mail to support content other than plain text. Notes mail now supports MIME directly, which means no conversion is required when interchanging mail across the Internet. Notes also supports S/MIME, the secure version of MIME.
X.509 certificates	The use of X.509 certificates allows interoperability with other certificate authorities.
Internet addressing support	Internet addressing is a native addressing format in Domino Release 5.

New feature	Function
LDAP support	Lightweight Directory Access Protocol (LDAP) is a directory service protocol that runs over TCP/IP. LDAP contains hierarchically arranged entries of person information. The hierarchy is often arranged to reflect an enterprise organization chart.
Support for Microsoft IIS	Internet Information Server (IIS) can now be used as an alternative to the native Domino HTTP engine for Web-enabled applications.
Mail features	
Headlines	The user sees a Welcome page called Headlines when the Notes Client is started. Lotus provides some standard Headline screens, but users have an option to create their own Headlines. Headlines provide an easy entry-point to mail and calendar functions, as well as to the Web. You can see an example of this in Figure 1 on page 19.
Subscriptions	Subscriptions work together with Headlines. A user can subscribe to a Domino application and display requested information on the Welcome page.
Bookmarks	Bookmarks replace the Notes desktop. You can add any Domino database, database view, or URL link to bookmarks to easily access the most often used information in your enterprise. Existing Web bookmarks are automatically imported from Netscape Navigator or Microsoft Explorer.
Navigation bar	This gives you the ability to navigate the Notes interface quickly and easily.
Window tabs	The Notes Client Window menu has been replaced with the Window tabs feature. Each open window is represented by a small tab on the screen, and you can easily jump between open windows or close a window without activating it first.
Enhanced views	The calendar view has had several improvements. You can now, for example, see the start and end times, the chairperson for the meeting, and the meeting location.
Print preview	The new Print dialog window enables you to preview the layout prior to printing. You can select from several different predefined print layouts, or create your own custom layout. This is especially useful for mail and calendar printing.
HTML editing	Notes fully supports the HTML 4 standard. You can view any Web page's HTML code from Notes and create your own HTML documents.

New feature	Function
Improved table features	Table features in Release 4 were relatively limited. The new version significantly enhances them. You can now create brand new table types including animated, tabbed, and linked tables with the standard table style.
Drag-and-drop	You can use drag-and-drop techniques to link information between different views. This works especially well for bookmarks.
Mail preferences	You now have greater flexibility to customize your mail settings. Preferences include, for example, automatic spell-checking on messages sent, as well as delivery priority and message importance.
Signature files	This feature allows you to automatically import a predefined signature for use with every message you send, to add contact information at the end, for example. HTML is supported, which enables you to use an animated GIF file for your signature.
Type-ahead addressing	This has been enhanced from the previous release.
Mail rules	You can filter mail automatically according to the rules you define.
MAPI support	Notes Client is MAPI enabled, which makes it possible to use Notes as your mail client from other applications supporting MAPI. For example, you can send an Internet message from Internet Explorer using Notes.
Notes Minder	Notes Minder is a notification utility for Windows 95/98/NT platforms. It periodically checks for new mail or missed alarms while the Notes Client is not actually running.
Calendar features	
Calendar preferences	The calendar preferences let you, for example, define your free time information, or set delegation information.
Support for paper types and sizes	You are not limited to any special paper type or size. You can select the hard copy format that best suits your needs.
Group calendar view	You can now open several people's calendars at the same time. You can define one or more group calendars to gain a convenient overall view of your colleagues' or team's schedules.
Holiday support	Administrators can define company holiday schedules, which users can then add to their personal calendars.

New feature	Function
Improved invitation form	Gives you more versatility when sending invitations.
Resource management	Release 5 gives you more flexible ways to manage resources. One of the new features is offline booking of resources.
Enhanced alarm support	You can now choose to play a .WAV file as an alarm to notify you about upcoming meetings or appointments. Alarms can now also be sent to attendees.
Owner Actions button	You can easily reschedule, cancel, or confirm a meeting as chair person. You can also view participant status.
Participant Actions button	A participant can easily accept, decline, delegate, or propose a new time for a meeting with a single button.
Copy Into button	You can copy the contents of a meeting invitation, task, or e-mail into a new memo, calendar entry, or task.
Mobile features	
Disconnected use	Additional offline capabilities have been introduced in Release 5.
Lightweight Mobile Directory	This feature enables you to store user directories with hundreds or thousands of entries on your local machine without using large amounts of disk space. The Lightweight Mobile Directory is optimized for mobile use by storing only critical information.
PDA support	Notes supports Personal Digital Assistant (PDA) devices to allow you to synchronize your calendar and mail between your PC and your PDA.
Locations	Lotus provides a wizard to simplify creation of location documents for different configurations.
Collaboration features	
Search	Now the search button is always visible. The search feature has been enhanced in several ways, including: • Improved dialogs • Paged result set • Summarization of search results
Localization features	

New feature	Function
Enhanced language support	Two new languages have been added in R5: Arabic and Hebrew. Vietnamese will be added later on, bringing the total number of supported languages to 41. Language switching on the fly is supported.
Enhanced unicode display	Notes displays characters of any character set on any language platform.
BiDi support	Support for bidirectional text.
Alternate name support	Notes now support two different names stored in a single ID file. For example, you can store a name with Roman characters and add a second name using Japanese characters.
Spell-checker enhancements	There are several new features including recognition of names and several new language dictionaries including Finnish, Hungarian, Polish, and Hebrew.
Keyboard switching	Automatic keyboard layout switching on the fly is allowed.
User-selectable character set	You can reload a mail message with the correct character set.
Automatic language switching	A document on server can have a language tag, enabling the Web client to display the appropriate language version of the document when the feature is active on both client and server.

The Notes Client user interface, only available for the Windows family (Windows 95, 98, NT), has had several major changes since Release 4. First of all, the Notes work space, although still available, is no longer the preferred way to view your data. When you open the Notes R5 Client, a Welcome page is displayed. This default Headlines page allows you to navigate to your Mail, Calendar, Personal Address Book, and the To Do list. You can select between a number of predefined pages or create and customize a page of your own. A customized Headlines page is shown in Figure 1 on page 19. Here, the user has decided to display their inbox, Calendar, and a Web page in the same window (items 5, 6 and 7, respectively).

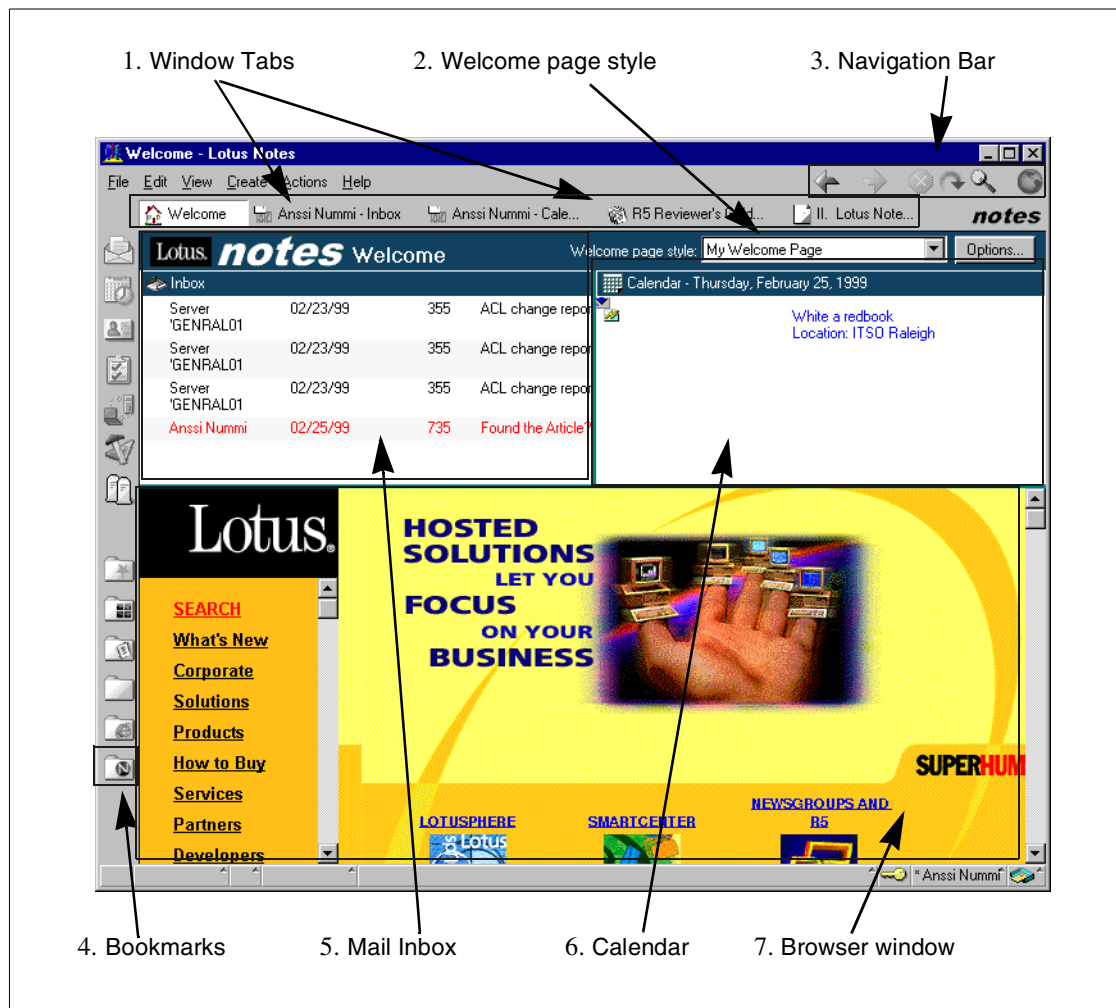


Figure 1. The new Notes Client user interface

Window tabs (1 in Figure 1) replace the Window menu. Now, you can jump between Notes windows quickly by clicking the relevant tab.

The Welcome page, also referred as the Headlines page, can be selected and customized using the drop-down list and the Options button (2 in Figure 1). You can choose what kind of information you want to display at startup and select a preferred layout.

The Navigation bar (3 in Figure 1) lets you switch between documents or recently opened views in much the same way as Web browsers do. You can

also refresh the current page using the Refresh button. It does not matter whether the active page is a Web page, a view of your incoming mail, or your calendar. You may also open a URL link here.

Bookmarks buttons (4 in Figure 1 on page 19) are used to navigate between your Mail, Calendar, To Do list, and your databases. So Bookmarks, in fact, replace the work space in Notes R4. You can add the most frequently accessed Domino databases to the Favorites bookmarks folder. You can also bookmark your favorite Web links, and bookmarks that you have set up in Netscape Navigator or Microsoft Explorer are also accessible from here.

1.6.2 Lotus Domino Administrator R5 for Windows

Lotus Domino Administrator is used to maintain and administer your Domino environment. Using this client gives authorized individuals the ability to perform the day-to-day administrative tasks necessary to keep your Domino environment running smoothly. For example, you can register servers, people, and organizations, set rules for Internet addresses, monitor your Domino servers, display logs, and stop and start server tasks.

The Administrator tool in R5 (see Figure 2 on page 21) also allows you to administer Domino servers in another Notes domain. This enables larger organizations to administer their entire enterprise infrastructure at a single point of control, if so desired.

For more information about managing your Domino server with this client, see 7.3, "Using Domino Administrator for Windows" on page 237.

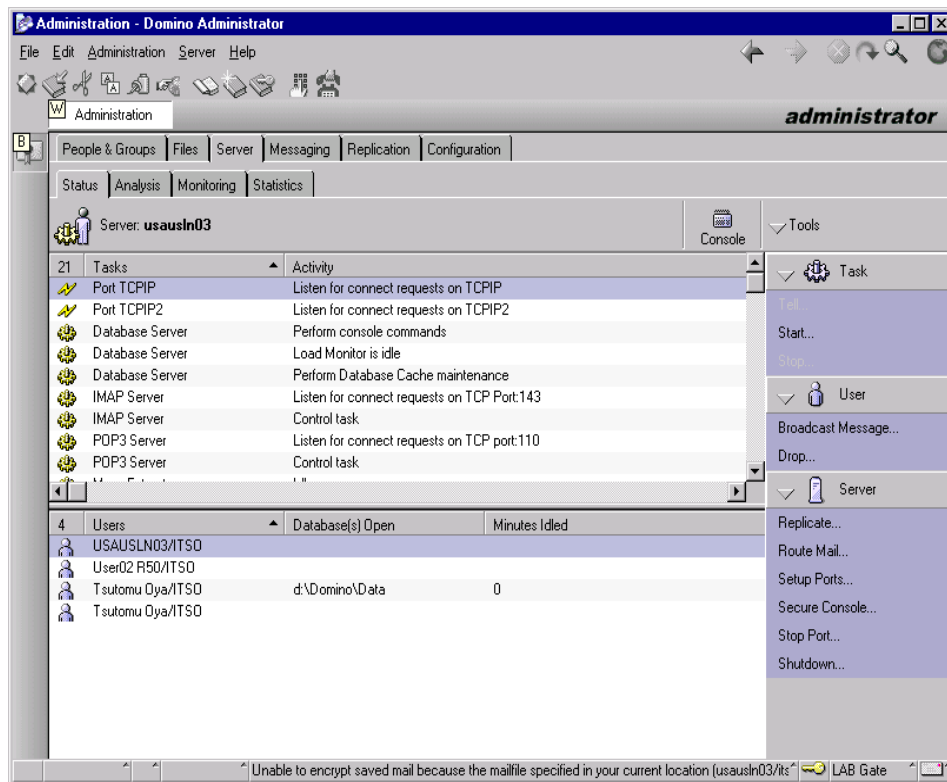


Figure 2. Lotus Domino Administrator R5

1.6.3 Lotus Domino Designer R5 for Windows

The Domino Designer tool is used to create and modify databases and applications. Much of the basic function of the designer is carried over from Notes R4, such as support for Notes functions and LotusScript and creation of forms and views for databases.

Figure 3 on page 22 shows the Lotus Domino Designer R5.

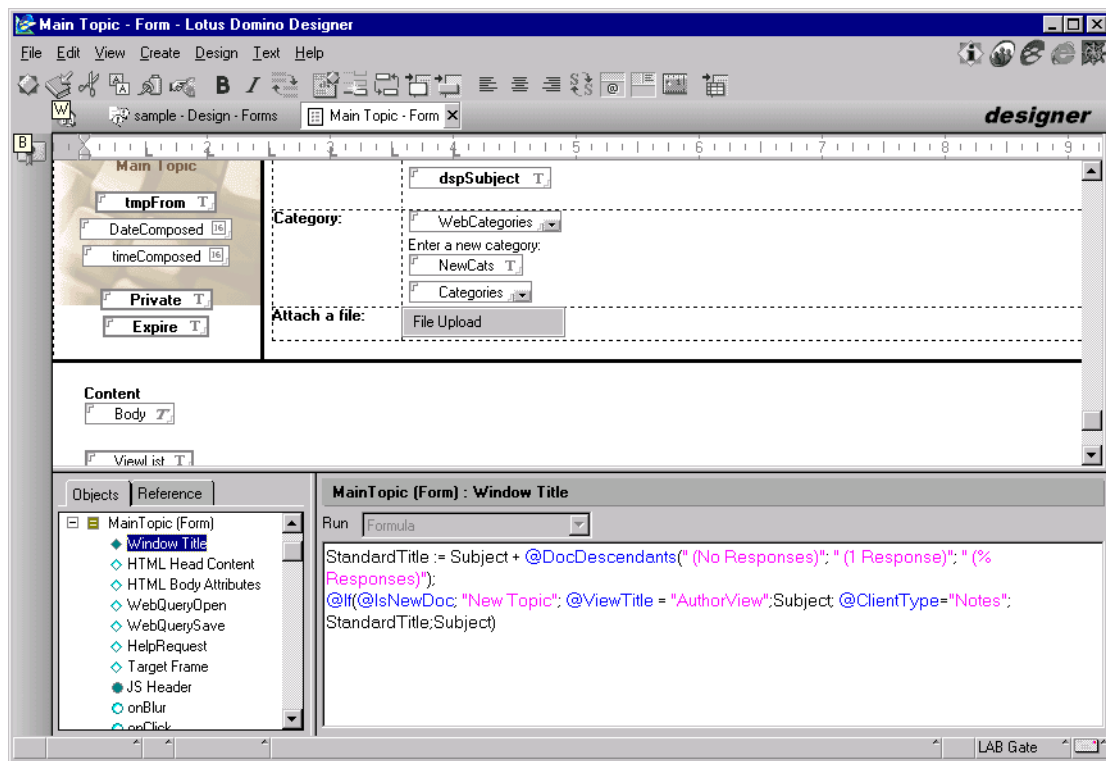


Figure 3. Lotus Domino Designer R5

Like the other client components, the user interface has changed since R4. However, there are quite a few new features as well, including:

- *Outlines* are provided to act as skeletons for your applications.
- *Pages* can now be used to display information, links to documents, and views in the database.
- You can now create *framesets* in Domino without any HTML code. Framesets are commonly found in many Web pages.
- A design synopsis feature lets you generate a detailed database report that includes the database size and the access control list.
- JavaScript support has been added.

If you want to know more about application development for Domino R5, refer to *Lotus Domino Release 5.0: A Developer's Handbook*, SG24-5331. This book describes how to use LotusScript, JavaScript, IIOP, CORBA, and other advanced features within Domino R5. You can also learn how to create

multilingual applications. The publication is available on the Internet at the following URL:

<http://www.lotus.com/redbooks>

Chapter 2. Preparing for installation

This chapter discusses network-related issues, such as how to configure TCP/IP protocol and NetBIOS protocol on OS/2 Warp Server. To get maximum performance and the maximum number of users for these protocol, we need to carefully configure MPTS and LAN Server/Requester (if you choose to use NetBIOS).

TCP/IP protocol is always required

As of this release, Domino requires the TCP/IP protocol for installing and configuring the product and for Web administration.

2.1 Hardware requirements

Resource requirements will be different depending on the server's role, the number of clients supported, performance requirements, and so forth. This section shows the minimum hardware requirements for Lotus Domino R5.

Table 3 shows the basic hardware requirements of Domino R5 for OS/2. Actual resource requirements may be different depending on server configuration. For performance tuning information, see Chapter 5, "Optimizing your Domino environment" on page 145.

Table 3. Resource requirements for the OS/2 platform

Platform	OS/2
Certified operating systems	IBM OS/2 Warp Server V4 IBM OS/2 Warp Server Advanced V4 IBM OS/2 Warp Server Advanced SMP V4 IBM OS/2 Warp Server for e-business
SMP support	Yes ¹
RAM	48 MB minimum 128 MB or more recommended
Disk space	750 MB minimum ² 1 GB or more recommended
Disk swap space	16 MB

Platform	OS/2
Notes: 1) Only available on Warp Server V4 Advanced SMP and Warp Server for e-business. 2) Disk space requirements include estimated free disk space amounts for a functioning Domino system (that is, one or more mail databases and applications). The actual disk space needed to install the Domino files is lower than the minimum and recommended values. Installing the Domino server software on an OS/2 system requires a HPFS, HPFS386, or JFS volume, because some Domino installation file names exceed the FAT limitation of the 8.3 file-naming convention.	

2.1.1 Network protocols supported

Table 4 describes which protocols are supported by Domino R5 for OS/2. For more detail, see 2.1.1, “Network protocols supported” on page 26 and 2.2.2, “Running Lotus Domino R5 on NetBIOS” on page 29.

Table 4. Supported protocols on Domino R5 for OS/2

Protocol ¹	Support
NetBIOS/NetBEUI ²	Yes
NetBIOS over TCP/IP	Yes
TCP/IP	Yes
X.PC ³	Yes
Notes: 1) Other protocols that are not on the list, for example, SPX/IPX, VINES, and so on, are not supported. 2) Notes SPX and NetBIOS port driver (Novell NetBIOS) are not certified or supported on an OS/2 Warp Server platform. 3) Analog modem or ISDN modem using AT command strings.	

2.1.2 CPU considerations

In this section, we review CPU considerations briefly, including:

- Overview of CPU usage
- SMP enabling

2.1.2.1 CPU

Before upgrading your existing R4 system to R5, you should make sure that the CPU is not close to becoming a bottleneck. You can use Netfinity Manager to collect information on CPU utilization information. Other vendors provide their own tools for these purposes. The average CPU utilization should not exceed 70 percent. If the average is higher than this, the CPU is

becoming a bottleneck. Peak values can be higher or even 100 percent, but the peak should not last for too long a time at this value.

When speaking about processing power, there are three issues to be considered: the CPU speed, the number of CPUs, and the size of the L2 cache. Tests have shown that a larger L2 cache gives a noticeable performance boost. On Windows NT, we have seen about 10 percent improvement when the L2 cache has been upgraded from 512 KB to 1 MB. The actual improvement varies depending on the number of CPUs installed. The same kind of results are also expected on the OS/2 platform.

Adding more CPUs requires that you must be running the SMP version of OS/2. OS/2 provides a robust multiprocessor environment and is a very good choice for running Domino. You should note, though, that adding an extra CPU does not double the CPU performance. Part of the CPU cycles will be used for multiprocessor management because there is no dedicated processor for that purpose in Intel platform design.

Upgrading the processor is one of the options for better performance as well. If you look at the raw processing power, a 2-way Pentium 400 MHz Pentium II Xeon processor doubles the 2-way 400 Mhz Pentium Pro performance. The actual performance difference in a real production environment is not that large.

2.1.2.2 Symmetric Multiprocessing (SMP)

The design of Domino has fundamentally changed. Conceptually speaking, in the R4 design, each client is handled by a dedicated thread. This thread waits for user input and then handles the client's transaction from beginning to end. This design minimizes inherent latency (wait time) and gives optimal CPU processing time per transaction. However, the design has other inherent limitations. Although any individual client interacts relatively infrequently with the server, the client's dedicated thread consumes server system resources at all times. Large client populations require large numbers of threads and system control blocks associated with these threads. This design does not scale well to large client populations.

The R5 design uses temporary worker threads to handle client transactions. Some of the worker threads handle network I/O, and other workers handle disk I/O. Handling a client transaction involves scheduling units of work to pools of worker threads. Conceptually, this design allows very large client populations because individual clients consume minimal system resources when not in the midst of performing a transaction. However, this design has inherent latencies and more path-length per transaction due to worker thread scheduling overhead.

From the above discussion, one should expect that Domino R5 needs more processing power per transaction compared to R4. Also, the minimum response time for Domino R5 transactions is longer than the same transaction on R4. These expectations are proven in the measurement data.

2.2 Software requirements

Domino R5 is required to be configured from a Web browser after basic installation. TCP/IP must be installed and configured on the Domino R5 server. Therefore, make sure the latest FixPaks are applied to your system. For information on currently available FixPaks, refer to Appendix A, "Obtaining FixPaks" on page 283.

2.2.1 Running Lotus Domino R5 on TCP/IP

The preferred protocol to be used in a Domino R5 environment is TCP/IP. Unless you already have TCP/IP in your network, implementing TCP/IP is a very complex undertaking and is beyond the scope of this document. The following sections assume that TCP/IP is installed and configured properly.

2.2.1.1 Name resolution using DNS

If you intend to have Domino server names resolved rather than specifying an IP address, there are several ways to accomplish this.

Apart from local files, such as HOSTS, if a Domain Name System (DNS) is available and set up for your Domino servers, a Domino server name can be resolved through the following methods:

- A fully qualified DNS name, for example, domino.banking.net.
- Assuming the system is in the DNS scope, the host name, for example, domino, may be used.

2.2.1.2 Name resolution using Domino documents

A Domino connection document must have been previously created on the first Domino server in the Domino domain. For more details, please refer to 3.2.6, "Choosing administration settings for the additional server" on page 73.

A summary of the name resolution order in a TCP/IP environment is as follows:

1. Use a previous successful connection (if there is any).
2. Use a server or connection document.

If you use an IP address rather than DNS name, IP address resolution will be immediately done with the connection document.

If you use a DNS name rather than IP address, IP address resolution will be done by using DNS name resolution, asking the DNS server, and/or using the hosts file.

The DNS name must be resolved by using the DNS name server or hosts file.

3. Use a fully qualified Internet address.

If you do not have a server or connection document, a fully qualified DNS name will be used to resolve the IP address by asking DNS server.

If you use only a host name for the server name, name resolution will be limited within a single domain if you use a DNS server.

4. Use a passthru server.

If all the above methods fail, a passthru server will be used for name resolution. Do not forget that locating a passthru server also requires name resolution.

2.2.1.3 Name resolution using a Domino name server

During configuration of either a Domino server or Notes workstation, if the server you are trying to connect to is not able to be resolved using TCP/IP, a dialog box appears allowing you to enter a server name and IP address using the same rules as described above. Although the dialog box indicates that you should enter a secondary name server, you can enter the IP address of a Domino name server and the IP address for your mail server instead of the secondary name server and address. Domino stores these values in a location document in the Domino Directory (formerly called the Personal Address Book).

More details about name resolution logic can be found in Appendix C.3.2, "How servers make a connection" on page 304.

2.2.2 Running Lotus Domino R5 on NetBIOS

Domino R5 provides only one port driver, inetbios.dll, for the IBM NetBIOS protocol. In the previous Domino release, the iibmeenb.dll driver was provided. Starting with Domino R5, you need to have LAN Requester installed on the machine because the inetbios.dll driver requires the IBM LAN Requester to be running.

2.2.2.1 Domino server NetBIOS resource usage and limitations

The OS/2 LAN Server (ibmlan.ini) and MPTS (protocol.ini) configuration files contain default values for maximum sessions, commands, and names for NetBIOS. The default NetBIOS resources should be appropriate for Notes workstations, but may not be appropriate for some Domino servers. In this section, resource usage rules are discussed.

Domino R5 for OS/2 only provides an inetbios.dll port driver for OS/2 NetBIOS protocol. NetBIOS resources are shared by the LAN Server/Requester and Domino port driver. To configure Multiple Protocol Transport Services (MPTS) and OS/2 LAN Requester correctly, we have to know how NetBIOS resources are used by the Notes Client and OS/2 LAN Requester.

A Notes workstation that uses NetBIOS protocol uses one session and one or two commands for reading or writing databases.

Although the NetBIOS protocol on OS/2 supports a maximum of 1000 sessions, the inetbios.dll port driver only supports a maximum of about 100 users. This is regardless of the NetBIOS resources, number of adapters, and so forth. This is due to the way this port driver uses 16-bit named system semaphores.

2.2.2.2 MPTS configuration

To determine the values used to specify the NetBEUI capacity parameters, we need to know the RAM usage of the IBM OS/2 NetBEUI protocol driver so that total system RAM usage does not exceed 64 KB. Table 5 lists the RAM usage (in bytes) per item, as well as the parameter corresponding to each item as it is displayed on the Parameters for IBM OS/2 NetBIOS window. A distinction is made between 386 and Pentium-based workstations. (Note that the figures for 386-based workstations also apply to 486-based and Pentium-based workstations.)

An applet, nb64k.exe, is provided to assist in these calculations. If this tool is not available, the following tables are provided. These values may vary between releases, but the nb64k.exe tool can be used to detect any changes. nb64k.exe does not update the protocol.ini file. New values must be entered using the MPTS Configuration Utility. Read the table as follows: Setting the

GDT selectors parameter to 15, for example, results in adding 150 bytes (15 x 10 bytes) to the total system RAM usage.

Table 5. IBM OS/2 NetBEUI RAM usage

Data area item	Related parameter	RAM usage in bytes (386 CPU)
Overhead for adapter work and communication area	N/A	7800
Each name	Maximum names	76
Each session	Maximum sessions	0
Each selector	GDT selectors	10
Each name in remote name directory	Number of names in remote name directory	0
Each I-packet	I-frame descriptors	108
Each UI-packet	UI-frame descriptors	124
Each loopback packet	loopback frame descriptors	148

The total system RAM usage is the sum of the RAM usage for all data area items.

For 386-based workstations, the sum of RAM usage for all data area items except Maximum sessions must be less than or equal to 64 KB:

7800 bytes overhead
64 bytes x Maximum commands
76 bytes x Maximum names
10 bytes x GDT selectors
108 bytes x I-frame descriptors
124 bytes x UI-frame descriptors
148 bytes x Loopback frame descriptors

<= 64KB (65535 byte)

With the above restriction, we can allocate NetBIOS resources for any NetBIOS application including the IBM LAN Server and Requester. The parameters we need to know are as follows:

- Maximum sessions
This must be less than or equal to 254.
- Maximum commands
This must be less than or equal to 255 for NetBIOS over TCP/IP.
This must be less than or equal to 3,000 for OS/2 NetBIOS.
- Maximum names
This must be less than or equal to 254.

2.2.2.3 IBM LAN Server/Requester configuration

The MPTS configuration provides the minimum amount for NetBIOS resources. The OS/2 LAN Server/Requester uses its own resources from this global resource pool provided by MPTS. The Domino server will use its own NetBIOS resources from the ones that have been allocated for the LAN Server and Requester.

The `laninst.exe` command is available to configure NetBIOS resources for the OS/2 LAN Server and Requester.

Assign the following NetBIOS resources for LAN Servers and Requesters for each logical/physical adapter:

- Sessions should be less than or equal to 254.
- Commands should be less than or equal to 255.
- Names should be less than or equal to 254.

As a general rule, allocate twice as many commands as sessions, plus five additional commands. For example, if you need 100 sessions, then allocate 205 commands.

MPTS allows you to have 1000 sessions on one physical network adapter configuring four NetBIOS over TCP/IP or using four physical network adapters.

Note

The recommended values apply only to Domino. These values are in addition to those required by or already allocated for LAN Server (`ibmlan.ini`) or other NetBIOS applications in the system. The sum of all these NetBIOS resources must not be greater than the global settings in the `protocol.ini` file.

For more information on changing the maximum sessions, commands, and names values for LAN Server Resources (`ibmlan.ini`), see the online book

Performance and Tuning, which is also shipped with the OS/2 Warp Server families.

2.2.2.4 LAN Requester considerations

The netbios.dll network driver uses the Submit interface and makes calls to the netapi.dll dynamic link library. To use this network driver, you need to install File and Print Services and have LAN Requester running before you start the Domino server.

Note

During the setup process, the LAN0 port driver is used by default if you select to install the NetBIOS driver. If you do not have the File and Print Services installed on your system, the setup process may not finish correctly.

To avoid a duplicate name on the network, the first 15 characters of the Domino R5 server name must be unique within the NetBIOS network.

2.2.2.5 Configuration parameters for the iibmeenb.dll port driver

The following parameters are no longer valid for the Domino R5 server:

- NETBIOS_lana_resource_program
- NETBIOS_resource_program
- NETBIOS_resource

These parameters are for the R4.x iibmeenb.dll port driver, which is no longer included in R5.

2.2.3 File system considerations for Domino R5

A file system is essentially a hierarchical structure of directories, each directory containing either more directories (referred to as subdirectories) or files. The main purpose of the file system is improve management of data by allowing the data to be organized and easily managed.

With the increase in disk and disk array size comes a need for larger partitions and files. This rise in storage capacity has facilitated the need for improved file system management and recovery.

IBM OS/2 Warp Server for e-business introduces two key features to help meet new server demands: the Logical Volume Manager (LVM) and the Journaled File System (JFS). JFS is designed for high throughput and reliability, as well as providing quick recovery times that are essential factors

in improving server availability and performance. It is specifically targeted for large application server missions running on an SMP server, such as Domino server. Performance of these application servers is comparable to earlier HPFS386-based Warp Servers on SMP machines, while providing increased scalability when installed on SMP servers. In combination with the new Logical Volume Manager (LVM) feature, JFS also supports partitions that span physical volumes.

Note

Since JFS is a Ring-3 implementation it is highly recommended to use SMP machines because the file system competes with application serving. HPFS386, which is a Ring-0 implementation, is always faster than JFS. The more processors there are, the closer the performance towards HPFS386 file system. Domino R5.0.2 and later are certified to run on the JFS file system.

The previous disk partition limit was 64 GB and the previous file size limit was 2 GB. JFS supports partitions and files of up to 2 TB, as well as dynamic expansion, allowing greater flexibility in data storage and management.

Domino R5.0.2 takes full advantage of JFS, and therefore, files can now be as large as the partition size, up to 2 TB.

Along with file system and file size growth, Domino databases can also grow larger than in previous versions. Domino R5.0.2 now supports databases larger than 2 GB.

The JFS file system recovery time, required during system failures and hard drive failures, has been significantly improved when compared with HPFS386-based OS/2 Warp Servers. While large HPFS386 file systems could require hours to recover, generally, that time has been reduced to minutes for JFS, which is able to simply play back its transaction log or journal to restore the file system.

The traditional HPFS386 system continues to provide world-class file and print performance for large enterprise environments. If you want to use HPFS386 with Warp Server for e-business, it can be purchased separately.

The choice of the most appropriate file system is important for the performance of your system. This section summarizes the performance and key features of the supported file systems and discusses where it would be most appropriate to use them.

File Allocation Table (FAT)

One of the simplest methods for storing data on disk is with File Allocation Table (FAT). FAT is a file system, but not an Installable File System (IFS). It is a part of the operating system kernel. FAT is simply an unsorted linear table designed for locating directories and files. It has low memory and disk administrative overheads. FAT is best suited for small disk systems, namely floppy disks, since it was optimized for performance by reading the FAT content into memory. Today, when hard disks sizes are in gigabytes or in tens of gigabytes, FAT is a very poor choice because of its design. For example, because on large hard disks the allocation table is very large and cannot be read into the memory as a whole, the hard drives have had to make several head movements to read a single file, which has had an overall effect of slowing down the system.

Important

The FAT file system is not suited for Domino because of its inherent design limitations. Domino requires long file name support.

The original implementation of FAT had a partition limit of 32 MB, which was later increased to 2 GB. One of the biggest problems with FAT has been the automatic incremental jump in allocation unit size when the disk partition size increases. An allocation unit is the smallest addressable unit on the disk. This has led to large amounts of disk storage wastage with small files. For example, on a 560 MB disk partition, the allocation unit is 16 KB. So, if you store a 1 KB file on the disk, it will actually take up 16 KB of disk space.

Another problem stems from the way data information is written one after another, in a chain, to disk. It starts from the outer edge of the disk, fills in towards the middle, then starts at the outer edge again. This quickly leads to disk fragmentation since space forms in the middle of the chain from file deletion. As a file gets modified, parts of it can end up being stored in different areas of the disk, resulting in excessive head movement and slow response times. Finally, FAT is restricted to an 8.3 naming convention, often preventing meaningful names from being given to files.

2.2.3.1 High Performance File System (HPFS)

HPFS addresses some of the concerns that are prevalent with FAT. HPFS is a 16-bit implementation file system and was created specifically for a multitasking environment. It is especially efficient when handling large partition sizes and large numbers of files. One thing you should avoid is allocating more than 5000 files in a subdirectory or directory. When you exceed 5000 files, you will start to degrade performance. The HPFS file

system shipped with the OS/2 Warp 4 and Warp Connect product has a cache limit of 2 MB. There is no such limit when using the HPFS386 file system shipped with OS/2 Warp Server Advanced. HPFS also followed a new concept in file system implementation called the Installable File System (IFS). An IFS is a file system that is not imbedded into the kernel. An IFS driver, which contains code needed to manage media formats other than DOS, is loaded during the system boot phase.

HPFS has, by design, a better structure than FAT that prevents data fragmentation. This is due to the new disk layout, whereby, the tables that describe the location of files and free space are positioned at regular intervals throughout the partition from the center of the disk. Also, new file and directory information is written where there is enough free space. This reduces fragmentation and prevents excessive movement of the disk arm(s). HPFS supports only a 512 byte allocation unit (cluster size) no matter how large the partition becomes and also supports long file names up to 255 characters. Critical for the high performance of HPFS is the caching technology it uses to access the disk. The lazy-write design writes data to a memory cache before writing to disk, giving faster overall performance. The drawback is that data may be lost if the computer is suddenly turned off preventing the cache from being written to the disk.

Data location by the file system is also improved in HPFS through the use of a sorted Balanced tree (B-tree) structure to store the file information. This speeds up the searches for files because HPFS can quickly transverse down the correct branch of the tree to locate the file, whereas FAT has to look sequentially through an unsorted linear table. The drawback of this process is that it takes slightly longer to write the file, but it is greatly compensated by the speed of locating a file.

Note

HPFS is not recommended for Domino due to limited cache size.

HPFS cache

If you have installed your Domino server on a standard HPFS drive, you should specify the cache size and the caching record threshold in the IFS= statement in the config.sys file. The IFS statement is described below.

Syntax for HPFS initialization is:

```
IFS=pathname [/CACHE:<size in kilobytes>] [/CRECL:x parameter] [/AUTOCHECK:drive[drive...]]
```

For example, to set the cache to 2 MB and enable auto checking on drive C:

The explanations for each parameter are shown in Table 6.

Table 6. HPFS initialization parameters

Parameter	Description
pathname	Specifies the pathname of the HPFS IFS.
/CACHE:<size in kilobytes>	Specifies the amount of memory in KB that is used for file system disk caching. If this parameter is omitted, the default value is 10 percent of the available physical memory. The maximum size is 2048 KB.
/CRECL: x	Specifies the maximum record size for caching where the maximum record size (x) is a multiple of 2 KB. The smallest maximum record size for caching is 2 KB and the largest is 64 KB. The default is 4 KB.
/AUTOCHECK:drive[drive...]	Tells the system to check each drive listed to see if it was shut down properly. If not, it will run CHKDSK on only the drives indicated.

HPFS386

With the release of the 80386 (and higher) class of microprocessors, the HPFS design was able to be further enhanced and tailored for the networking environment, resulting in a new version of HPFS called HPFS386. Bundled with the Advanced version of the server code, HPFS386 provides extremely fast access to large disk volumes and optimized performance in the server environment.

HPFS386 is a 32-bit implementation of a file system and was developed to tightly integrate with the server code, at Ring 0, allowing data to be transferred directly from the HPFS386 cache to the network adapter driver. This resulted in accelerated network I/O, leading to faster data access by clients. Other features incorporated in HPFS386 were a greatly increased cache size, local security, software fault tolerance support for RAID-1 (mirroring and duplexing), directory/user-based disk space limitation, and increased file access-related limits. An advantage introduced with HPFS386 was the storage of Warp Server Access Control Lists (ACLs) within the directory and file structures, thus making fast user verifications leading to faster client access to the file. ACL information in HPFS is stored in a separate file called net.acc, and the overhead of accessing this file slows down verification.

For file server implementation, the decision between HPFS386 and JFS is dependent upon the server configuration. The biggest drawback with HPFS386 is recovery time considerations when the system crashes, and the system is configured with very large disk partitions. Recovery still relies on chkdsk to check and fix disk errors.

HPFS386 cache

You can tune the HPFS386 file system by adjusting the size of the disk cache. To do this, you must edit the hpfs386.ini file and change the cachesize parameter or increase the installed physical RAM.

The HPFS386 cache is not pageable and will reduce the amount of memory available for other applications running on your server, including Domino. This may result in increased swapping on a memory-constrained machine. If heavy swapping occurs, you should decrease the size of the HPFS386 cache.

HPFS386 will not use all the memory spaces. Cache usage is limited to 60 percent of the available memory as a default and big buffers space and request buffers space are also defined by the parameters. Correctly managing the cache size can lead to significant performance improvements on the server system and improve performance of applications with high disk I/O requirements.

HPFS386 can also take advantage of the lazy-write function. This can provide significant performance improvement when writing to disk. However, if security and auditing is of major importance in your installation, you may wish to ensure that all information logged by Domino is written to disk immediately. If this is the case, we recommend that you inactivate the lazy-writing option.

Lazy-write (or write-behind) defers writing data to the disk until the operating system is idle or when the update is a maximum of five seconds old. This allows control to be returned to the application without having to wait for completion of I/O operations.

The following is an example of an hpfs386.ini file:

```
[filesystem]
useallmem = Yes
lanroot = C:\IBMLAN
cachesize = 23808

[lazywriter]
lazy = *: ON
maxage = 5000
bufferidle = 500
```

```
[DASD_Limits]
ThreshAlertNames = *: ADMINS
ThreshAlertDelay = *: 10
ThreshAlertUser = *: yes
DirFullAlertNames = *: ADMINS
DirFullAlertDelay = *: 10
DirFullAlertUser = *: yes
```

The `[filesystem]` section specifies general file system parameters:

- `useallmem = [yes|no]`

This parameter specifies whether the HPFS386 should use memory above the 16 MB boundary. Some adapters, for example, the IBM Token-Ring Busmaster Server/A, cannot do Direct Memory Access (DMA) to memory above the 16 MB boundary. If you have a LAN or disk adapter that cannot do DMA to memory above the 16 MB boundary, the HPFS386 must use only memory below 16 MB so that the adapter can put data into the file system buffers. Set `useallmem` to yes if all of your adapters can access memory above the 16 MB boundary. Set `set allmem` to no if any of your LAN or disk adapters cannot access memory above the 16 M boundary. If `useallmem` is not specified, the default setting is no. All the disk controllers and network adapter cards on the market today support memory access beyond the 16 MB limit.

- `cachesize = nnnn`

This parameter specifies how many kilobytes of memory the HPFS386 should claim for its cache. The cache size must be a minimum of 256 KB. The maximum value is determined by the size of available memory. If `cachesize` is not specified, the default is to use 20 percent of available memory, if the amount of available memory is below 20 MB, or 60 percent of available memory, and if the amount of available memory is 20 MB or more. Available memory means the total system memory minus the memory spaces that are already used by device drivers and OS/2 before HPFS386 is started.

- `maxheap = nnnn`

This parameter sets a limit on the size of the heap. `nnnn` is the maximum number of kilobytes to which the heap can grow. The HPFS386 allocates heap memory as needed. If this parameter is used, the HPFS386 only allocates memory for the heap up to the amount specified. If this parameter is not used, there is no limit on the heap size. Use this parameter only if you need to reserve memory on the system for other applications that may be running. The minimum value is 64 KB. The maximum value is determined by the size of available memory minus the

size of the cache. If maxheap is not specified, the default is to have no limit on the heap size.

- lanroot = drive:\path

This parameter specifies the drive and path of the directory for the LAN Server software. The installation program fills in this parameter for you. You do not need to change this parameter.

- fsprealloc = nn

This parameter specifies how many big buffers to allocate when the file system is initialized. If neither fsprealloc nor srvprealloc are used, the file system allocates big buffers as needed. The allocation of big buffers can take a little time. Allocating the big buffers at initialization improves the performance of the first requests that need big buffers. The buffers are not freed until the system is shut down. The minimum value for fsprealloc is 2. The maximum is 64. If both fsprealloc and srvprealloc are specified in this file, fsprealloc is used and srvprealloc is ignored.

- srvprealloc = nn

This parameter specifies how many big buffers to allocate when the server is started, rather than when the file system is initialized. This parameter, like the fsprealloc parameter, can improve the performance of the first requests that need big buffers. The buffers are freed when the server is stopped. The minimum value for srvprealloc is 2. The maximum is 64. If both fsprealloc and srvprealloc are specified in this file, fsprealloc is used and srvprealloc is ignored.

The [lazywriter] section specifies settings for the lazy-write function. You can use the CACHE386 program to change the internal setting of these parameters while the system is running. When you reboot the system, the parameters are set to the values in this file. The settings are as follows:

- lazy = [drives:] ON/OFF

This parameter specifies whether the lazy-write function is to be turned on or off for the specified drives. The [drives:] can be a series of drive letters. For example, lazy = cd: on would turn on the lazy-write function on drives c: and d:. An asterisk (*) can be used for the drive letter to indicate that all drives are to have the setting. This line can be used multiple times to achieve the settings you want for your drives. If lazy is not specified, the default value is to turn the lazy-write function off for all drives.

- maxage = [drives:] nnnn

This parameter specifies the maximum number of milliseconds that can pass before the lazy-write function writes the contents of a buffer to the

disk. The [drives:] can be a series of drive letters. For example, `maxage = cd: 5000` would set the maximum buffer age to 5000 ms on drives c: and d:. An asterisk (*) can be used for the drive letter to indicate that all drives are to have the setting. This line can be used multiple times to achieve the settings you want for your drives. The minimum value is 0. The maximum value is 1000000. If maxage is not specified, the default value is 10000 for all drives.

- `bufferidle = [drives:] nnnn`

This parameter specifies the maximum number of milliseconds during which a buffer is not used before the lazy-write function writes the buffer contents to the disk. The [drives:] can be a series of drive letters. For example, `bufferidle = cd: 500` would set the buffer idle time to 500 ms on drives c: and d:. It would not change the settings for drive e: or h:. An asterisk (*) can be used for the drive letter to indicate that all drives are to have the setting. This line can be used multiple times to achieve the settings you want for your drives. The minimum value is 0. The maximum value is 500000. If bufferidle is not specified, the default value is 1000 for all drives.

The [DASD_Limits] section specifies settings of parameters for the DASD Limits function:

- `ThreshAlertNames = [drives:] [user1] [user2] [group1] [group2]`

This parameter lists the users or groups that are to be notified when a DASD Limits threshold is crossed on the specified drives. Any mixture of user names or group names can be used. All of the names must appear on one line. This line can be used multiple times to achieve the settings you want for your drives. If ThreshAlertNames is not specified, the default is to have no user or group names.

- `ThreshAlertDelay = [drives:] nn`

This parameter specifies how many minutes to wait before sending another alert for a threshold that was previously crossed on the specified drives. If a threshold is crossed more than once within the delay period, an alert is sent only for the first occurrence. An alert is sent if a higher threshold is crossed during the delay period. This parameter is used to cut down on the number of alerts that can be generated when there is a lot of disk activity and the disk size is within the threshold. This line can be used multiple times to achieve the settings you want for your drives. If ThreshAlertDelay is not specified, the default is 10 minutes on all drives.

- `ThreshAlertUser = [drives:] yes/no`

This parameter specifies whether to send an alert to the user whose disk usage caused a threshold to be crossed on the specified drives. This line can be used multiple times to achieve the settings you want for your drives. If ThreshAlertUser is not specified, the default is yes for all drives.

- DirFullAlertNames = [drives:] [user1] [user2] [user3]

This parameter lists the users or groups that are to be notified when a DASD limit is reached. Any mixture of user names or group names can be used. All of the names must appear on one line. This line can be used multiple times to achieve the settings you want for your drives. If DirFullAlertNames is not specified, the default is to have no user or group names.

- DirFullAlertDelay = [drives:] nn

This parameter specifies how many minutes to wait before sending another alert for a DASD limit that was previously reached. If a DASD limit is reached more than once within the delay period, an alert is sent only for the first occurrence. This parameter is used to cut down on the number of alerts that can be generated when there is a lot of disk activity and the DASD limit is reached several times. This line can be used multiple times to achieve the settings you want for your drives. If DirFullAlertDelay is not specified, the default is 10 minutes on all drives.

- DirFullAlertUser = [drives:] yes/no

This parameter specifies whether to send an alert to the user whose request failed because a DASD limit was reached. This line can be used multiple times to achieve the settings you want for your drives. If DirFullAlertUser is not specified, the default is yes for all drives.

2.2.3.2 Journaled File System (JFS)

The Journaled File System is an Installable File System (IFS) that was built on IBM AIX JFS technology. However, the disk-image layout differs due to the feature set of the file system that is unique to OS/2 Warp Server for e-business.

One of the shortcomings of HPFS and HPFS386 is the amount of time required to recover from a system crash on large hard drives. JFS overcomes this by providing a robust, quickly-restartable, transaction-oriented, log-based high performance 32-bit file system for OS/2. It is primarily tailored for the high throughput and reliability requirements of modern servers, especially in the TCP/IP environment.

The JFS provides the same range of supported file system operations for organizing and managing physical files, which was traditionally provided by

HPFS. However, in its first release, the JFS is not bootable. The JFS is created in a logical volume and can be expanded across disks to meet disk requirements. It supports both file and partition sizes up to 2 TB, and can recover within minutes from a system crash. The JFS has been enhanced for performance scalability on Symmetrical Multi Processor (SMP) systems and for TCP/IP transactions, making it ideal for Web and Domino data serving. Another feature of the JFS is its support for *Sparse Files*, making it ideal for large databases. Sparse files allow large database structures to be defined, but occupy only the amount of disk space that is consumed by the database; thus, a 2 TB file can be created on a 2 GB partition if there is less than 2 GB of actual data to be stored.

The journaled file system is implemented through a set of operating system commands that allow creation, management, and deletion of files. Special 32-bit extension has been added to optimize JFS performance. To support large cache size, the VIRTUALADDRESSLIMIT parameter must be reduced from the default 2048 to allow large caches (HPFS386 and JFS). When set to 512, cache sizes up to 640 MB have been tested.

JFS cache

In most cases, applications requesting data that resides on JFS-formatted partitions will receive the data from the JFS cache. The JFS cache, like HPFS, FAT, and HPFS386 caches, is initialized on startup. The JFS cache is configured and initialized by the IFS statement in the config.sys.

All buffer cache I/O is performed through explicit I/O requests to the underlying DASD device driver. The buffer cache resides in pinned memory and is shared by all mounted JFS file systems.

By default, the size of the JFS buffer cache will be 12.5 percent of the size of physical memory. Not all file system I/O will be performed through the buffer cache since the JFS supports the *NOCACHE* advisory file open mode. When this function has been requested for a file, the JFS will perform I/O directly between user buffers and the underlying device when processing read and write operations on the file.

To configure the JFS, an IFS= statement must be added to config.sys. This statement is described below:

```
IFS=pathname [/CACHE:<size in meg>] [/AUTOCHECK:drive[drive...]]  
[/L:OFF | /L:synctime,maxage,bufferidle]
```

For example:

Table 7. JFS initialization parameters

Parameter	Description
pathname	Specifies the pathname of the JFS IFS.
/CACHE:<size in MB>	Specifies the size of the JFS buffer cache in MB. By default, this size is set to 12.5 percent of the physical memory.
/L:<synctime,maxage,bufferidle>	Synctime is the interval at which the sync thread runs, default = 32. Maxage is the longest time that a frequently modified file is kept in cache, default = synctime * 4. Bufferidle is the time indicating a recent change. Changes newer than this value are not written unless the last write was older than maxage, default = MIN (1, synctime/8).
/AUTOCHECK:drive[drive...]	Specifies a list of JFS file systems, identified by driver letter, to be included in automatic recovery by CHKDSK at the time of JFS initialization. If an asterisk (*) is specified instead of a drive letter list, then all JFS file systems will be included in automatic recovery during JFS initialization. If any drive letter is preceded by an arithmetic plus sign (+), then CHKDSK will perform a full integrity check on the drive, even if journal log replay has restored the drive to an apparently consistent state. If the list of drive letters ends with plus-asterisk (+*), then CHKDSK will perform a full integrity check on all JFS file systems not specified in the list, even if journal log replay has restored them to an apparently consistent state.

System limits

The majority of the JFS size limits are imposed by the OS/2 kernel and system interfaces rather than the JFS itself. These limitations, both actual (OS/2 imposed) and potential (the JFS limit), are detailed below:

- **Buffer cache**

The size of the buffer cache is configurable and is limited by the amount of virtual memory that can be allocated to the kernel. If you need larger caches for HPFS386 or JFS, you must reduce VIRTUALADDRESSLIMIT= from its default of 2048. When it is set to 512, cache sizes up to 640 MB have been tested. The JFS cache is designed to support a cache up to 2 GB.

Note

During OS/2 Warp Server for e-business installation, if a JFS partition is not found on the system, the installation program sets the JFS cache size to only 1024 KB. Later on, if the user creates a JFS partition, the cache size still remains at 1 MB. This 1 MB cache size is too small for optimum performance and results in significant performance degradation. Unless you increase the cache size in the config.sys file or, if you are required to, re-install the server operating system, the JFS cache size will remain at 1 MB.

To change the JFS default cache size from its default value, edit the JFS.IFS statement found in config.sys to read:

```
DEVICE=C:\OS2\JFS.IFS /CACHE:xxxx /AUTOCHECK:D
```

Where xxxx is the size in kilobytes and D: is the JFS volume. For example, depending on the applications run on the server, you can set the cache size to between 16 and 32 MB on a system with 128 MB of RAM installed.

- **File System Size**

The maximum file system size, imposed by the width of the device driver I/O request interface, is 2 TB. However, the JFS is designed to support files of 512 TB (with a block size of 512 bytes) to 4 Petabytes (with a block size of 4 KB).

- **File size**

The file size limit has been increased to 2 TB. This is imposed by the width of the file offsets and sizes beginning at the DOS APIs. The JFS file size is governed by the underlining file system.

- **Number of file system objects**

The maximum number of files and directories within a single JFS system is well over 4 billion. This limit is imposed by the JFS and is due to the size of the unique ID (inode number) used by the JFS to identify files and directories within a file system, since the JFS represents inodes as a standard unsigned 32-bit integer.

- **Extended attributes**

The extended attributes for any single file or directory is limited to 64 KB. This limit is imposed by the width of extended attribute sizes beginning at the DOS APIs. However, internally, JFS has a size equal to the amount of storage that can be represented through a single extent. The size of an

extent varies from 8 GB (with a block size of 512 bytes) to 64 GB (with a block size of 4 KB).

HPFS386 features not available with JFS

HPFS386 has for some time been the most significant file system available for OS/2. Many additional features have been developed over time based on HPFS386. Some of these features are not yet available for JFS.

- **DASD limits**

The current version of JFS shipped with OS/2 Warp Server for e-business does not support DASD limits. Depending on your requirements, there are several possible workarounds; two of them are:

- Keep the resources that need directory limits on an HPFS386 formatted volume.
- Use CHKSTOR as a replacement if it is sufficient to send an alert to the administrator when the limit is exceeded.

- **Fault tolerance (software RAID)**

There is no replacement for the HPFS386 fault tolerance feature in JFS. Current server hardware usually comes with RAID adapters that can be used to perform this function as a hardware solution.

If you still need to rely on the software disk mirroring provided by HPFS386, you will have to run HPFS386.

2.2.4 Comparison of features between file systems

Table 8 summarizes the differences in features between FAT, HPFS, HPFS386, and JFS.

Table 8. Feature comparison between FAT, HPFS, HPFS386, and JFS

	FAT	HPFS	HPFS386	JFS
Cache	14.4 MB	2 MB ¹	1 GB ²	2 GB ²
Notes: ¹With the HPFS cache, the 2 MB limit is due to limits imposed by the 16-bit IFS architecture. ²Actual maximum size limited by system configuration, 200 - 700 MB typical. ³ACL is limited to 8192 for FAT, CD-ROMs, and HPFS, and this information is stored in the last half of net.acc. ⁴FAT imposes a limit on the root directory, which can be 112 or less. For hard disks, it generally has a value of 256 or 512 hardcoded in the boot sector. Although subdirectories are theoretically unlimited, performance can be seriously degraded if the number of files per directory is greater than the <i>number of buffers</i> (set in config.sys). ⁵Direct Access Storage Device.				

	FAT	HPFS	HPFS386	JFS
Max. no of file opens	65536	65536	65536	65536
Max. no of file finds	3072	3072	8192	32768
Max. file size	2 GB	2 GB	2 GB	2 TB
Max. partition size	2 GB	64GB	64GB	2 TB
ACL Support	net.acc	net.acc	in Fnode	in Inode
ACL Limit	8192 ³	8192 ³	unlimited	unlimited
Max. no of connections	16384	16384	16384	16384
Max. no of shares	1500	1500	1500	1500
Max. no of file per directory	512 ⁴ on the root directory	limited by DASD ⁵ space	limited by DASD ⁵ space	4 billion
Bad block relocation	No	Yes	Yes	Yes using LVM
Notes: ¹ With the HPFS cache, the 2 MB limit is due to limits imposed by the 16-bit IFS architecture. ² Actual maximum size limited by system configuration, 200 - 700 MB typical. ³ ACL is limited to 8192 for FAT, CD-ROMs, and HPFS, and this information is stored in the last half of net.acc. ⁴ FAT imposes a limit on the root directory, which can be 112 or less. For hard disks, it generally has a value of 256 or 512 hardcoded in the boot sector. Although subdirectories are theoretically unlimited, performance can be seriously degraded if the number of files per directory is greater than the <i>number of buffers</i> (set in config.sys). ⁵ Direct Access Storage Device.				

2.2.4.1 Logical Volume Manager

Even with the rapid advances in Direct Access Storage Device (DASD), modern hard disk capacity still has not managed to satisfy corporate demands, such as dynamically increasing DASD storage and spanning across physical disks. As a result, a new solution was needed to simplify DASD management within OS/2. An integral part of the solution is the introduction of the Logical Volume Manager (LVM) in OS/2 Warp Server for e-business replacing FDISK.

LVM provides an abstraction layer for the file system, in that it makes transparent to both applications and users the logical/physical makeup of the volume. LVM (lvm.exe) exploits new features of the underlying logical volume management system, thus allowing flexible division, allocation, and management of the system disks. It provides all the function of FDISK and

additional features, such as disk spanning, dynamic resizing, and sticky drive letters.

The objective of LVM is to provide a logical layer for the support of logical volumes for the OS/2 DASD I/O subsystem. With the introduction of LVM support, a partition is no longer restricted to logical partitions wholly contained on physical drives. Disk spanning is now allowing dynamic partition resizing for JFS volumes.

LVM vs. Compatibility volumes

Only LVM volumes can be expanded. Compatibility volumes that are formatted with the FAT or HPFS file system cannot be expanded.

In order to implement the LVM functionality, some existing OS/2 components have been modified and a number of new components added. The performance and SMP scalability has been improved by converting parts of the existing kernel execution environment from 16-bit to 32-bit. This new kernel execution environment is used by JFS, LVM, OS2DASD, and TCP/IP.

2.2.4.2 Performance considerations

As already mentioned, the JFS code has been highly optimized for the 32-bit environment. Additional 32-bit code has been included in the OS/2 kernel for JFS to gain performance from the flat 32-bit memory address space. The 32-bit implementation also allows JFS to scale better in SMP environments.

Additional APIs have been added to the instruction set to allow TCP/IP applications, such as Domino, to have gains in performance. This results from the direct access some TCP/IP instructions have to data stored in the JFS cache. Preliminary tests have shown that JFS serving local applications (thus acting as an application server) outperforms HPFS386 by almost doubling performance. When used to serve Domino to a large number of users, it was shown that the response time of JFS was quicker than the Windows NT NTFS.

Unfortunately, JFS performance as a file and print server is not as easy to compare with HPFS386. First, when any performance comparisons between HPFS386 and JFS are made, networking consideration need to be eliminated. The network bottleneck will impede server performance long before the file system will; therefore, a fast network is recommended. In fast networks, it is the hardware configuration of the server that is going to govern the choice of file systems. If the server is only a uniprocessor, JFS can have up to a 40 percent degradation over HPFS386.

The reason for the difference in file serving throughput between JFS and HPFS386 is increased path length for JFS due to the additional ring transitions it must do. These extra ring transitions require extra CPU cycles.

JFS scales better in an SMP environment. Therefore, at 4-way throughput between HPFS386 and JFS, it has been shown to be similar, with HPFS386 only slightly better. However, in 5-way or better, JFS is expected to excel. If the server CPU is under utilized, less than 50 percent free most of the time, JFS performance could be equivalent to HPFS386 in 4-way or less scenarios since the CPU will have enough time to process the ring transitions.

Another point that may need to be considered is whether the hardware configuration provides fault tolerance. If not, HPFS386 is still a better option since it provides software RAID-1 (both mirroring and duplexing) fault tolerance. This may be a consideration in small server installations.

No software fault tolerance with JFS

If disk fault tolerance is required, it is recommended to use hardware-based solutions instead of software-based solutions. Hardware RAID solutions typically provide better performance, better reliability and easier maintenance.

2.2.5 Deciding on fault tolerance

A Domino server tends to be disk I/O-intensive. Therefore, you should not underestimate the importance of the disk subsystem. The first guideline is that you only use disk controllers designed for server environments. And, if possible, select a SCSI RAID adapter instead of regular SCSI adapters. Redundant Array of Inexpensive Disks (RAID) typically provides both better performance and high availability.

On IBM server platforms, the new ServeRAID-3L or 3H adapters are excellent choices. Both adapters support RAID levels 0, 1, 1 enhanced, and 5, and both adapters also come with 4 MB of cache or more.

You can improve the disk I/O throughput by spreading the workload across several physical hard disks. For example, you could install the operating system and the Domino server executables on the first physical disk and all the Domino databases on the other hard disks as shown in Figure 4.

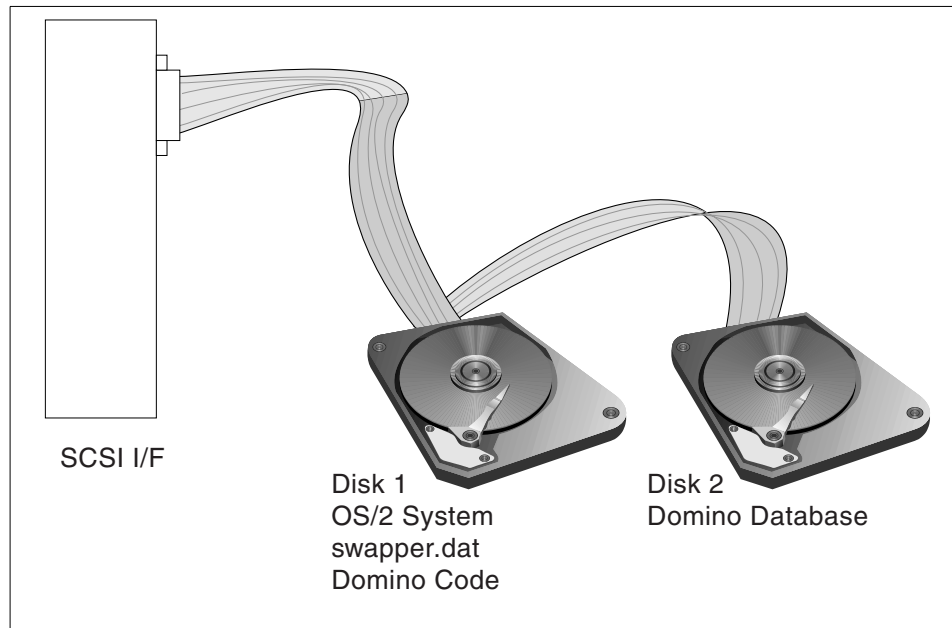


Figure 4. A non-RAID disk configuration

The swapper file `swapper.dat` should reside on the same physical drive as the operating system. The operating system and Domino server typically cause very little hard disk activity. Domino databases (or mail files) are typically very disk intensive, and therefore, it is recommended to dedicate one or more physical disks.

If you want to further improve disk I/O, you can add one extra physical hard disk and enable Domino transaction logging. For instructions to enable transaction logging, see 5.3.6, “Transactional logging” on page 160. You should never place the transaction log and the Domino databases on the same physical disk device.

If more disk storage space is required for the databases, you can distribute the workload on multiple hard disks by using Domino Directory links.

If better performance is required, a RAID disk subsystem is required. RAID stands for *Redundant Array of Inexpensive Disks* and means that two or more physical disks are grouped together and they appear to the operating system as one (or more) physical disk. All the disks in the RAID array should be the same size.

The RAID standard specifies several RAID levels, but IBM SCSI-based disk controllers support only the most used levels, which are RAID-0, RAID-1, RAID-1+, and RAID-5.

Note

The IBM RAID controller cache write policy should be changed from *write through* to *write back*. The controller should have optioned battery backup.

RAID-0 typically provides the best performance. In RAID-0 configurations, two or more disks are grouped together and the data is spanned evenly on all the disks. RAID-0 does not give any fault tolerance: If one of the disks fail, the whole disk group (or *disk array*) fails.

RAID-1 is disk mirroring and always requires two hard disks. The same data is always written to both the disks and, therefore, this RAID level recovers if one of the disks fail. RAID-1 performance is a bit worse than RAID-0, but because of its high fault tolerance, it is very widely used. The drawback is that RAID-1 wastes 50 percent of all the purchased hard disk space.

RAID-1+ is RAID-1 with several enhancements. RAID-1+ supports two or more hard disks in the array, but the data and mirrors are striped on the disks. RAID-1+ gives great performance and great fault tolerance. The cost of RAID-1 is 50 percent of the total disk space. In other words, if you purchase four 18.2 GB hard disks and configure them as RAID-1+, the overall disk capacity will be 36.4 GB.

RAID-5 is also referred to as disk striping with parity. RAID-5 requires more processing, because each time data is written, the checksum data is being calculated and stored in the array. RAID-5 read performance is very good, but write performance is worse than in RAID levels 1 or 0. RAID-5 disk configuration requires at least three physical hard disks. RAID-5 is cheaper to implement than RAID-1, because the checksum data requires only the disk space of one of the disks in the array. Note that the checksum is not stored on one disk, but is spread among the disks.

If you want to optimize the disk subsystem by using the RAID SCSI controller, one good configuration is shown in Figure 5 on page 52. As a rule of thumb, four to six data drives per processor is *balanced* system. An array of up to 16 drives on 4-way SMP is useful. For example, Netfinity 7000 (4 x 400 MHz CPU) can use up to 20 drives.

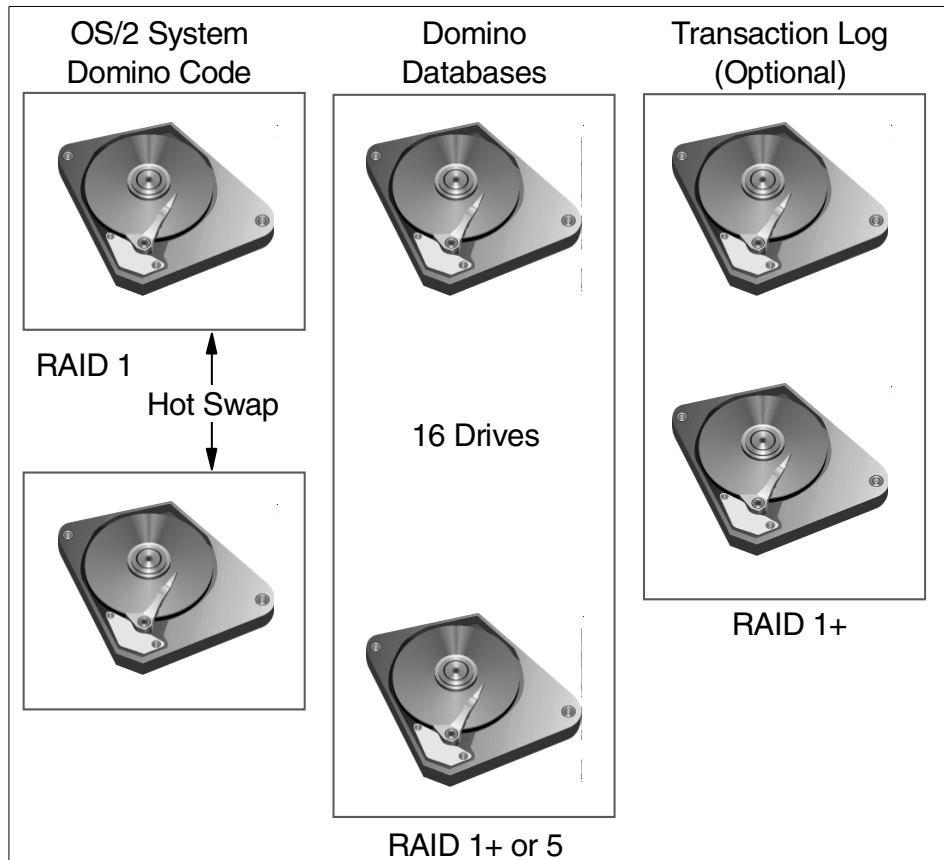


Figure 5. RAID system sample disk configuration

In this example, we have three RAID arrays configured: one for the operating system, paging file, and Domino executables, one for Domino databases, and one for transaction logging.

The number of disks required in the Domino database array to achieve maximum performance and capacity may often be more than is needed to satisfy the OS storage requirements.

If you require the best performance and reliability, you should configure your RAID subsystem to run RAID-1. RAID-0 is proven to be the fastest RAID level, but because there is no high availability whatsoever, it is not a good solution for Domino platforms.

You can also consider installing more than one RAID or SCSI adapters and distributing the databases, and the disk workload, across several SCSI channels and disk devices. For more information on this and many other disk configuration issues, refer to the IBM redbook *Netfinity and Domino R5.0 Integration Guide*, SG24-5313.

Recommendation

If best performance and high availability is required, we recommend configuring your Domino server to run on RAID-1 systems. You can also install several RAID adapters to distribute the workload on several SCSI channels.

On IBM Netfinity servers, Netfinity Manager is the best tool to gather information on RAID utilization.

2.2.5.1 Database distribution

RAID-1 is the best solution for the fastest disk I/O. For non-RAID systems, distributing the Domino databases across multiple physical disk devices can improve performance in highly stressed server environments. In practice, this means that instead of placing all the Domino databases on the same disk device, you create directory links to another disk device and place some of the databases on this device.

A directory (or database) link must be used, because all the databases should appear under the same Domino data directory. Using a directory link, you can make a directory on another disk device to appear under the Notes data directory. This technique is especially useful for mail servers and clustered servers. The *Netfinity and Domino R5.0 Integration Guide*, SG24-5313 details this technique.

2.2.6 Domino network design tuning considerations

In this section, we discuss some Domino network design issues that may affect the server and your whole Domino environment performance. The following topics are discussed here:

- Network subsystem considerations
- Network protocol selection
- Domino server role in the domain
- Replication topology
- Domino clustering considerations

Hint

For much more detailed information on Domino network and server design issues, refer to the IBM redbook *Netfinity and Domino R5.0 Integration Guide*, SG24-5313. You will find guidelines, for example, for Domino server naming conventions, network capacity planning, and many other issues.

2.2.6.1 Network subsystem

Optimizing the networking subsystem can be divided into two parts: the overall network design and the network adapter configuration on the server. The overall network design refers to how your actual network is designed, for example, whether the network is switched or not, how the routing is implemented, what protocols are supported, and so on. For example, it might be a good idea to connect all the main Domino servers directly to the switch and use full-duplex network traffic. Because network design optimization can be a very complicated issue, we are not going to go into any more depth here.

Network adapter configuration is something that can be changed relatively easily. One of the most commonly used performance tuning options is to install one or more extra network adapters to get wider network bandwidth. OS/2 supports up to 32 network adapter interfaces (up to four if you use GUI). You should use PCI adapter cards only in the server.

We also recommend that you run the TCP/IP protocol only, if possible. As mentioned earlier, Domino server supports a wide set of protocols, but some of the Domino features are specially optimized for TCP/IP, for example, Domino clustering.

2.2.6.2 Network protocol

We recommend using TCP/IP as the primary networking protocol for Domino R5. Domino supports a number of protocols, including TCP/IP, SPX/IPX, and NetBEUI/NetBIOS. Network protocols, such as NetBIOS, may impose limits on the number of connections your server can support. Using TCP/IP, the number of connections is limited only by the server capacity to process the network traffic. Using TCP/IP also gives you considerable freedom in your choice of client platforms, since you can use the HTTP server capabilities built into Domino to allow client access using Web browsers, as well as regular Lotus Notes Clients.

This release of Domino has been optimized for TCP/IP. TCP/IP has some other advantages. For example, the protocol is routable, which means it can be run natively on WAN over routers.

Recommendation

Use TCP/IP as the preferred protocol for Domino R5.

For more information, see 2.2.1, “Running Lotus Domino R5 on TCP/IP” on page 28.

2.2.6.3 Domino server roles

In a file/print server environment, you probably want to dedicate one or more servers for printing only, some servers for serving home directories, some servers for application program files, and so on. Dedicating one server to do just one thing makes administration easier, and even more importantly, allows the server to do just one thing and do it at its full capacity. Requirements for a print server, for example, are very different from a file server. Typically the file server gains an advantage from a huge disk cache, while a print server hardly ever gets any performance advantage from the disk cache.

This discussion applies to Domino server roles as well. To make one server a mail server, database server, Web server, remote connection server, and a directory catalog server may be a good solution in a small environment, but if you are planning hundreds or thousands or more users, this is not an ideal solution.

There is more than one way to categorize Domino servers by role, but the one we have found most useful is the one shown below:

- Mail server
- Database (or application) server
- Hub server
- Domain catalog server
- Extended search server

You can add other server roles, for example, directory server, which runs the Directory Cataloger and LDAP tasks and holds the Directory Catalog and Directory Assistance databases.

One example of Domino server roles and network design is shown in Figure 6 on page 56.

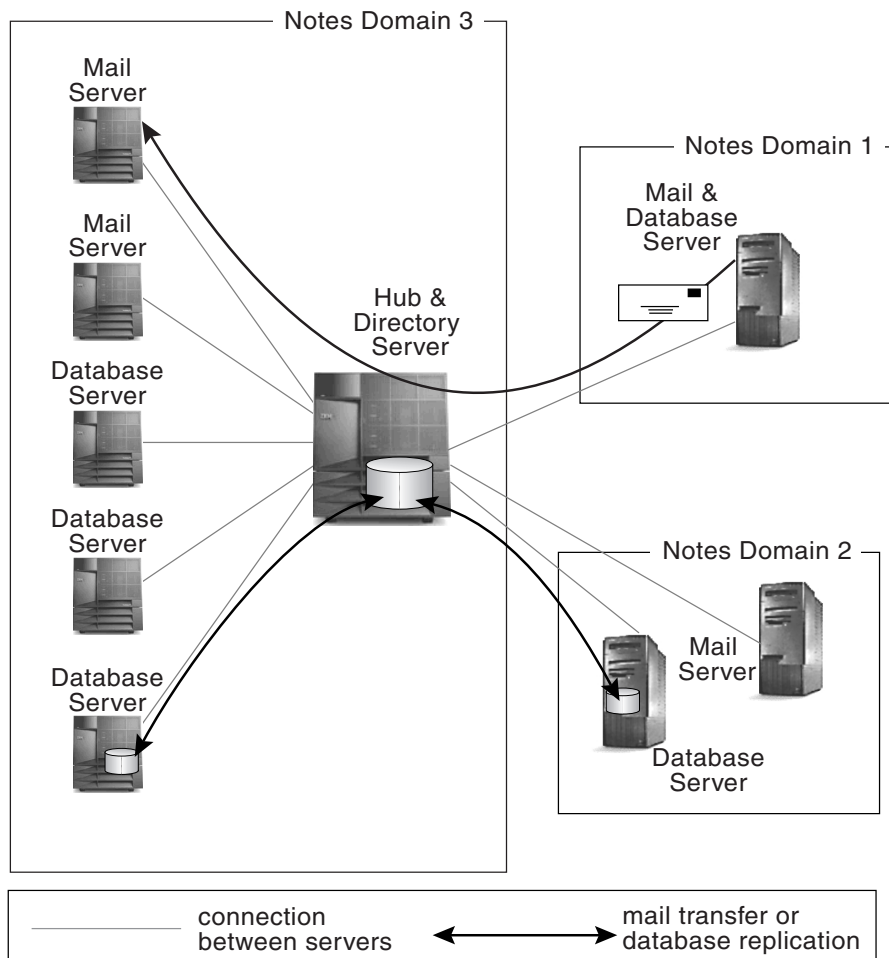


Figure 6. An example of server roles and Domino network design

In this example, the Domino environment consists of three Notes domains connected to each other with slower WAN links. To minimize the traffic across the slow links, each branch has at least one Domino server. The hub server is configured to execute the mail routing and database replication between the domains. The users in each domain access only their local Domino servers. The branch office Domino servers hold only replica copies of those database that are actually used on an everyday basis.

In conclusion, server roles are used to optimize a server to run fewer tasks with better performance. Domino network design and server roles are very

closely connected. Server roles and replication topology are very important issues when optimizing network traffic over WAN links. Additional information on server roles can be found in 5.4.1, “Server roles” on page 165.

2.2.6.4 Replication topology

By designing the replication topology and scheduling properly, you can affect server performance quite a lot. The first question is: Do you want to implement a hub-spoke network or replicate directly between the required servers? You may also need to consider which of the replicating server pairs run the replicator task, or both. And finally, what is the schedule for replication? A faster replication cycle keeps the databases more tightly in sync, but on the other hand, creates more network and server workload. Looser replication, in turn, takes less resources, but may compromise the data integrity.

There is no simple answer to replication questions because requirements vary greatly from one environment to another. You may want to consider hiring an IBM or Lotus specialist to help you with network design and optimization.

2.2.6.5 Domino clustering

Although Domino clustering is a solution for high availability, it can be used for performance utilization as well. In short, a Domino cluster means that between two to six Domino servers in the same Notes domain are logically grouped together to act as a cluster. Domino clustering is based on the fact that a database on a clustered server is replicated to one or more nodes in the same cluster. The data in the database is kept in sync by a special server task, *cluster replicator*, that runs on each clustered server. Cluster replication is event driven, so every time a database is being updated, the change is replicated to all the other replicas. Because this design is not realtime, there can be some delays before the changed data is replicated to other database copies. However, this delay time is typically seconds or tens of seconds.

When a user connects to a clustered server for the first time, it receives information on all the members in the cluster. When a user tries to connect to a database that is not available on the server, or the requested server is not responding, the database will be opened seamlessly from another server in the cluster holding a replica copy of the database. This is called fail-over.

In Domino R4, clustering fail-over was only available for Notes Clients. But in Release 5, Domino ships with the Internet Cluster Manager (ICM) that redirects the Web client requests inside the cluster.

The performance advantage is based on the fact that there are more servers serving the clients. The clustering itself creates a performance degradation on the server because of the cluster replicator task. Clustering also requires some extra processing power and hard disk space. For these reasons, two servers in a cluster do not mean twice the capacity.

Even though setting up a cluster means extra planning and more hardware investments, you would be getting a very high availability environment with great expandability and better overall performance.

You can find more information on Domino clustering on Windows NT in the IBM publications *Netfinity and Domino R5.0 Integration Guide*, SG24-5313, and *High Availability and Scalability with Domino Clustering and Partitioning on Windows NT*, SG24-5141. Most of the issues covered apply to the OS/2 platform as well.

Chapter 3. Installing a new Domino server

Domino R5 server installation and configuration tasks are easy and straightforward. New Notes Clients for server administration that were included in previous releases are no longer provided. Instead, a Web browser is required to configure the server after basic installation completes.

Before installation, Domino network planning is required, for example, the Domino server hierarchical structure, each server's role, certification structure, MPTS configuration, and LAN Server/Requester configuration should be planned if you use NetBIOS protocol. For planning tasks, refer to following publications:

- *Domino Release 5, Administering the Domino System Volume 1* (CT6T7NA) and *Volume 2* (CT6T8NA)
- *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, SG24-5341
- *Netfinity and Domino R5.0 Integration Guide*, SG24-5313

3.1 New installation of Lotus Domino R5

This section describes how to install Lotus Domino R5 on OS/2 Warp Server. Migration issues are discussed in Chapter 4, "Migrating from Domino R4.5 and R4.6" on page 83.

Make sure that hardware and software requirements, as illustrated in Chapter 2, "Preparing for installation" on page 25, have been met.

3.1.1 Installing Lotus Domino R5

Installation of Domino R5 is composed of two phases, file copy and configuration. To begin the first phase, perform the following steps.

1. Open an OS/2 window.
2. Change to the drive and directory where the Lotus Domino R5 for OS/2 product image resides.
3. To start the installation process, execute: `instpm`

4. The dialog box shown in Figure 7 appears.



Figure 7. INSTPM: Installation method dialog panel

5. Select the option that corresponds to your license agreement, then click **OK**.

These are the license options:

- **Domino Application Server** for the Domino Application Server license
- **Domino Mail Server** for the Domino Mail Server license
- **Domino Enterprise Server** for the Domino Enterprise Server license

6. When the Lotus Notes Installation and Instructions dialog panel appears, click **Continue**.

7. When the Install dialog displays, check **Update CONFIG.SYS**, then click **OK**.

8. Select the components to be installed from the Install - directories dialog shown in Figure 8. If you are uncertain what components to install, click **Select all**.

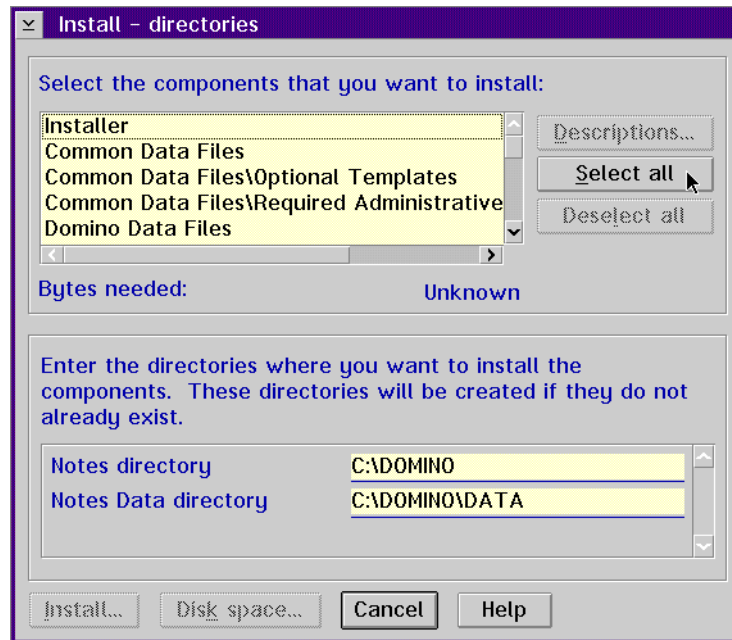


Figure 8. INSTPM: Install - directories dialog panel

If you want to change the Notes directory and Notes Data directory, modify them accordingly then click **Install....**

Note

The server certification ID (CERT.ID) file that is created during the configuration phase will be placed in the Notes Data directory. This is also known as the Domino Directory.

An installation progress indicator is displayed. After all files have been transferred successfully, you will be asked to reboot so that changes take effect. Click **OK**, then the installation program completes.

9. Shutdown and reboot the system.

3.1.2 Java environment considerations

Domino R5 for OS/2 includes a Java environment that should be used if you plan to support servlets through Domino's HTTP server. During the Domino

R5 installation, the Java environment component can be selected and will be installed automatically if you chose the **Select all** button shown in Figure 8 on page 61.

Java LIBPATH and PATH Considerations

The Domino R5 install program places its directories in front of the first directory entry of LIBPATH and PATH. You may need to change the directories order if your server has a system JVM installed also. As a general recommendation, always have \JAVA11 directories placed before any DOMINO entries.

3.2 Configuring Domino R5

In previous releases of Domino, configuration tasks could be performed from the Notes Administration client. Domino R5 server requires configuration from a Web browser after the installation. The Web browser must be JavaScript enabled.

Note

Before proceeding, we recommend making a backup copy of the setupweb.nsf file. This file keeps configuration information during configuration tasks described in later sections and will be deleted when you finish the configuration task.

If you have a backup copy of the original setupweb.nsf file, you can easily reconfigure the server without reinstallation process.

A setupweb.nsf file is located in the Notes data directory on the server.

3.2.1 Starting the HTTP server for configuration

To start configuration task, you have to start the HTTP server as shown below:

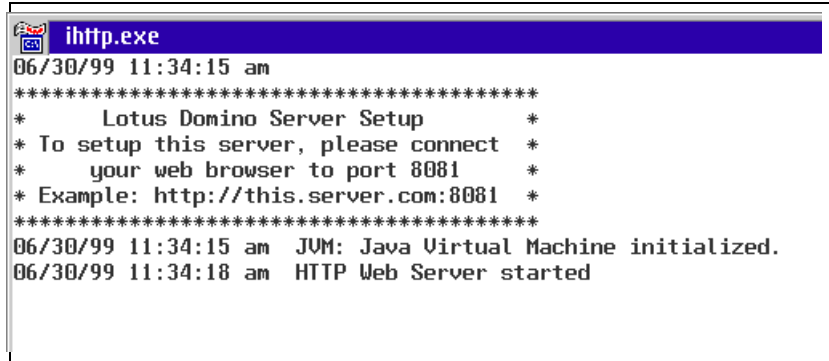
1. Click the Lotus Domino Server icon in the Lotus Applications folder or start an OS/2 window and change to a Domino data directory (default is c:\domino\data) and issue following command:

```
[d:\DOMINO\DATA] ihttp httpsetup
```

Note

If you start with the `iserver.exe` command instead of the `ihttp` command, this command will automatically start the `ihttp httpsetup` command the first time.

2. Check if the HTTP server successfully started. If the HTTP server successfully started, you may see the message, HTTP Web Server started as shown in Figure 9.



```
ihttp.exe
06/30/99 11:34:15 am
*****
* Lotus Domino Server Setup *
* To setup this server, please connect *
* your web browser to port 8081 *
* Example: http://this.server.com:8081 *
*****
06/30/99 11:34:15 am JVM: Java Virtual Machine initialized.
06/30/99 11:34:18 am HTTP Web Server started
```

Figure 9. HTTP: httpsetup command startup messages

3. Start a Web browser on the machine where you want to configure the Domino R5 server.
4. Using a Web browser, connect to the server with port number 8081. For example, type the following URL address and port to start configuration:

`http://IPAddress:8081`

IPAddress is the server's IP address.

3.2.2 Configuring the first domain server

Configuration tasks for a first domain server are shown below.

If you configure additional Domino servers, see 3.2.5, "Configuring an additional domain server" on page 72.

1. After connecting to the Lotus Domino R5 server, the 1. Create a New Domino Server page will be shown, as displayed in Figure 10 on page 64.

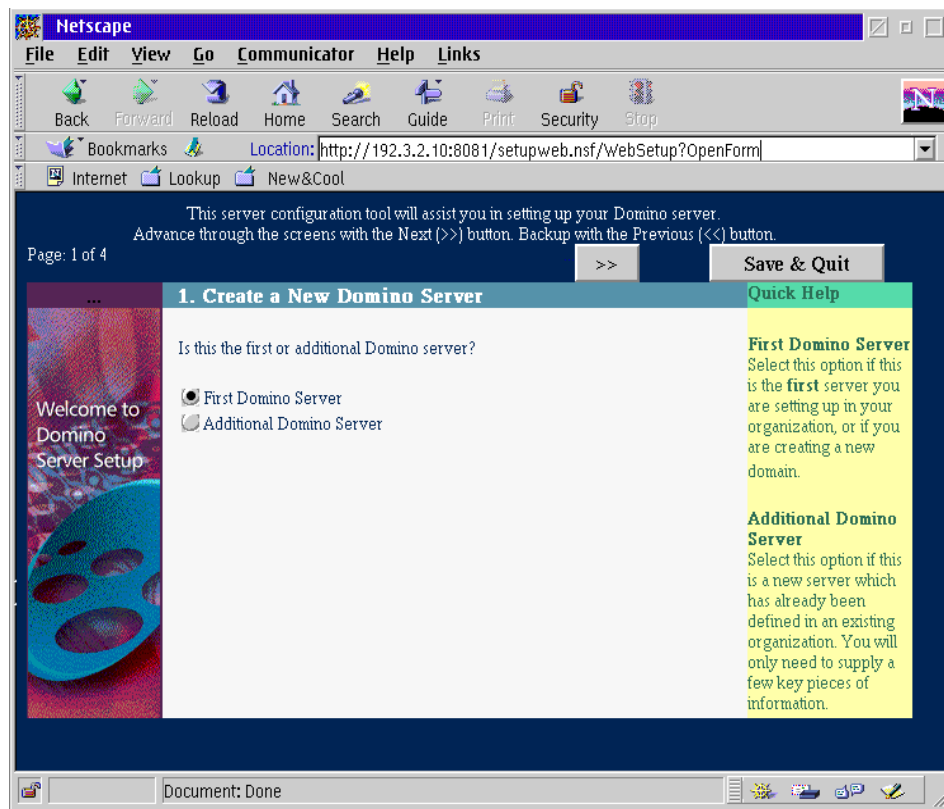


Figure 10. Domino configuration: Create a New Domino Server page

2. Select **First Domino Server**, then click the double right arrow button on the right top corner.

3.2.3 Choosing which type of client can access the server

To select which type of client can access the Domino server, complete the next screen, 2. Server Audience, shown in Figure 11 on page 65.

The configuration database lists server tasks that are automatically configured on the Domino server in the Standard Services section. You cannot modify this section because these tasks are essential for the server to function. Complete the following steps:

1. Select options from the Additional Services section based on your server configuration requirements.

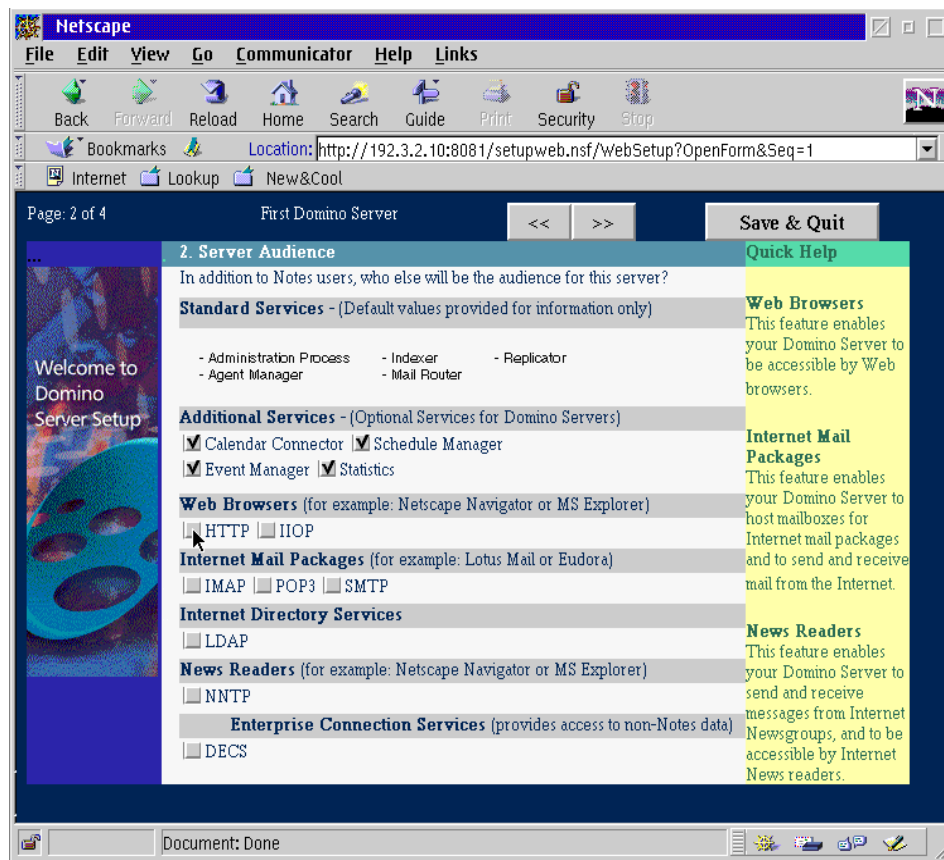


Figure 11. Domino configuration: Server Audience page

The Additional Services options are as follows:

Calendar Connector: If you want to use calendar and scheduling features on this server, select this option to install the Calendar Connector server task that enables Domino to use the Domino Directory for looking up users' free time information on another server.

Event Manager: If you want to use event monitoring on this server, select **Event Manager** to install the Event server task that creates the Statistics & Events database (events4.nsf) that monitors system activities.

Schedule Manager: If you want to use calendar and scheduling features on this server, select this option to install the

Schedule Manager server task that creates the Free Time database (busytime.nsf) that enables Domino to perform free time lookups for users on this server.

Statistics:

If you want to record server statistics, select this option to enable Domino to collect statistics about server activities such as mail, available disk space, and memory usage.

2. Select options from the Web Browsers section shown in Figure 12 on page 67, if you support connections from Web browsers such as Netscape Navigator.

This HTTP option sets the Domino HTTP settings in the new server's server document in the Domino Directory for optimal performance for the activities Web clients will perform on the server. The options are as follows:

HTTP:

If you want browsers, such as Microsoft Internet Explorer and Netscape Navigator, to access data on the server, select **HTTP** to install the Hypertext Transfer Protocol (HTTP) server task.

IIOp:

If you want Domino to handle client IIOp requests, select **IIOp** to install the Domino Object Request Broker (ORB), which allows Domino objects to respond to IIOp requests.

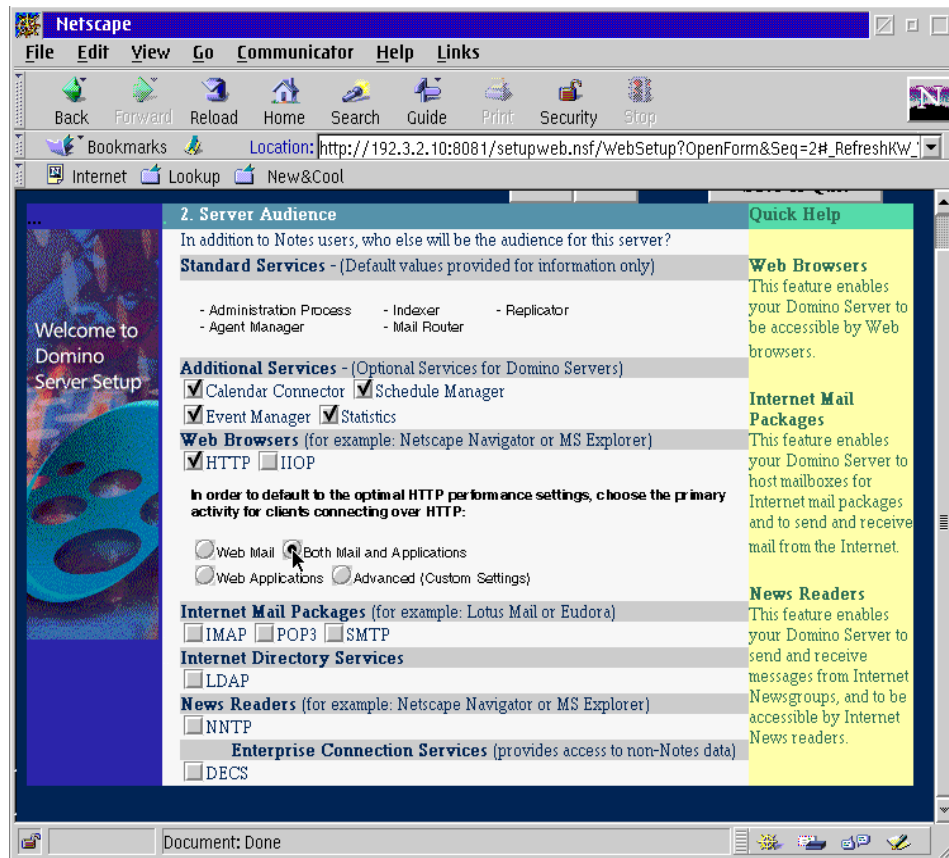


Figure 12. Domino configuration: Server Audience: Web Browsers section

If you select HTTP, choose the primary activity for clients connecting to this Domino server over HTTP (see Figure 12):

Web Mail: If the primary activity for Web clients is using mail, select **Web Mail**.

Web Application: If the primary activity for Web clients is using applications such as discussion databases or ordering applications, select **Web Applications**.

Both Mail and Applications: If Web clients will use both mail and applications on this server, select **Both Mail and Applications**.

Advanced (Custom Settings):

If you wish to manually set the HTTP settings for this server, select **Advanced (Custom Settings)**.

3. Select options from the Internet Mail Packages section according to client's needs. The options are as follows:
 - IMAP:** If you want mail clients using Internet Message Access Protocol (IMAP) to access mail on the server, select **IMAP** to install the IMAP server task.
 - POP3:** If you want mail clients using Post Office Protocol 3 (POP3) to access mail on the server, select **POP3** to install the POP3 server task.
 - SMTP:** If you want mail clients using Simple Mail Transfer Protocol (SMTP) to access mail on the server, select **SMTP** to install the SMTP server task.
4. Select an option from the Internet Directory Services section depending on the client's needs:
 - LDAP:** If you want clients using Lightweight Directory Access Protocol (LDAP) to access directory information on the server, select **LDAP** to install the LDAP server task.
5. Select an option from the News Readers section depending on the client's needs:
 - NNTP:** If you want news readers using Network News Transfer Protocol (NNTP) to access news groups and discussions on the server, select **NNTP** to install the NNTP server task.
6. Select an option from the Enterprise Connection Services section depending on the server configuration requirement to access outside a Domino database:
 - DECS:** If you want to access data stored outside a Domino database, such as in a relational database or enterprise resource planning system, click the arrow and select **DECS** to install Domino Enterprise Connection Services.

After the selection, click the right arrow. If you are configuring the first Domino server in a domain, go to 3.2.4, "Choosing administration settings for the first server" on page 69. If you are configuring an additional Domino server, go to 3.2.5, "Configuring an additional domain server" on page 72.

Note

You can return to a previous screen to change its settings by clicking the left arrow at the top right of the screen. The numbers at the top left of the screen indicate which of the four Configuration screens you are viewing.

You can leave the configuration database at any time and preserve your information by clicking **Save & Quit** in the top right of the screen. HTTP server will also terminate by clicking Save & Quit.

3.2.4 Choosing administration settings for the first server

You can change the default server settings on the third page of the configuration database, Administration Settings, shown in Figure 13 on page 70. For help on what terms mean, click the underlined blue labels (for example, Server Name) and hold down the mouse button to read the Help.

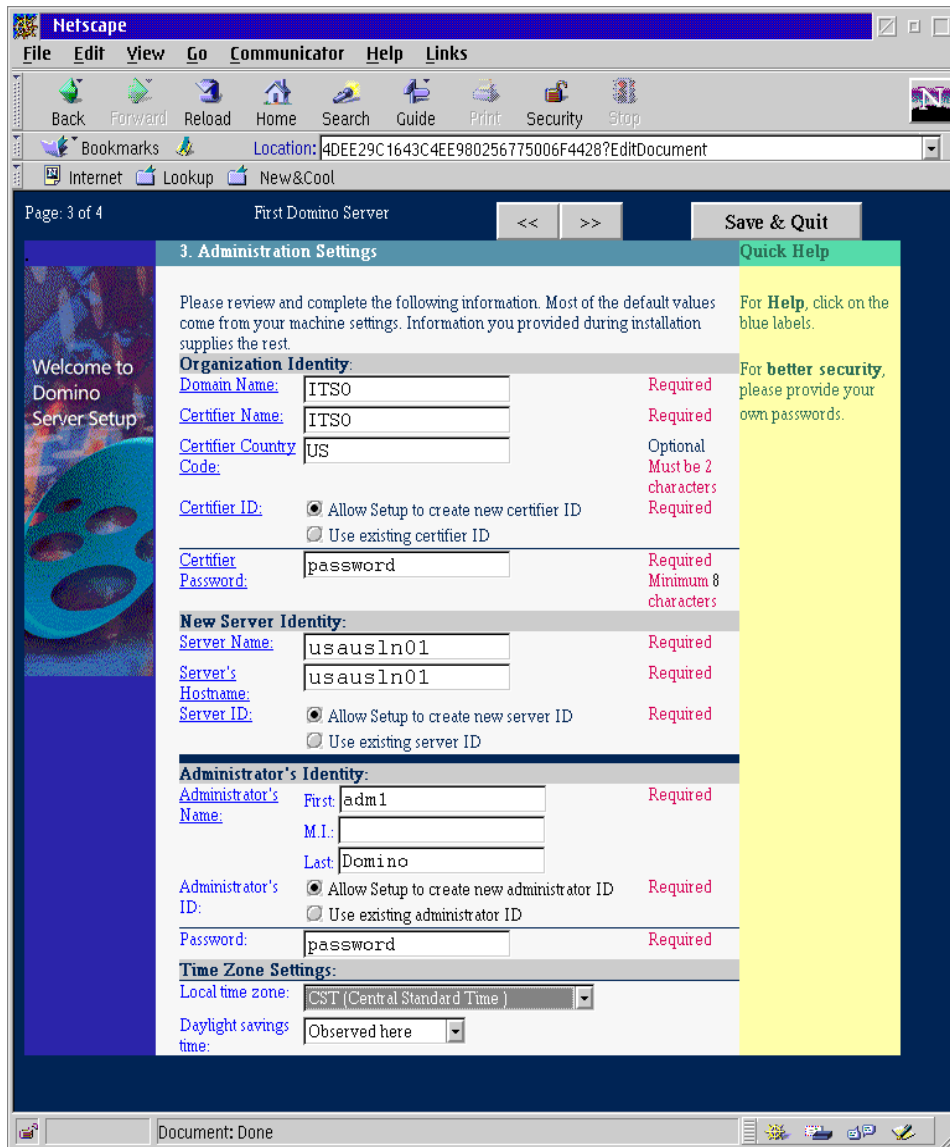


Figure 13. Domino configuration: Administration Settings

Complete the following steps:

1. Fill in the Organization Identity section:

Domain Name: This is the name of the Domino domain to which the server will belong and creates a domain to which you

can add other servers. The name can have a maximum of 64 characters.

Certifier Name: This is the name of the certifier used to stamp Notes ID files so that you can authenticate their identity.

Certifier Country Code:

(Optional) Enter a country code for your certifier.

Certifier ID: Select whether to create a new certifier ID or use an existing one. If your organization does not yet have a certifier ID, create a new one. If you select to use an existing certifier ID, enter the file name for the certifier ID you want to use.

Certifier Password:

Enter a certifier password. The password must be at least eight characters. Lotus recommends using mixed-case passwords of at least 13 characters. If you are performing Advanced Configuration and select to use an existing certifier ID, you do not need to specify a password.

2. Type the necessary information in the New Server Identity section:

Server Name: Enter a server name, for example, `usausln01`. This is the name of the new Domino server. Users and other servers access the server using this name (hostname works best).

Domino server names are unique names that identify servers in a domain. Server names can consist of one or more words (a maximum of 79 characters) and can consist of any characters except parentheses, at (@), slash and back slash (/ and \), equal (=), and plus (+). Using spaces is not recommended. If you use spaces, you must enter that server name in quotes (") when entering a command at the server console, for example, "Mail Server One."

If you use NetBIOS protocol, the first 15 characters must be unique within the network.

Server's Hostname:

Enter the hostname of this server. Hostname is stored in `config.sys` as an environment variable, `HOSTNAME`. To display the hostname, type `hostname` from the command prompt.

Server ID: Select whether to create a new server ID or use an existing one. If your organization does not yet have a Domino server ID for this server, create a new one. If you select to use an existing Domino server ID, enter its password and file name.

3. Type the necessary information in the Administrator's Identity section:

Administrator's Name:

Enter a first name, middle initial (M.I.), and last name for the server administrator.

Administrator's ID:

Select whether to create an administrator ID or use an existing one. If your organization does not yet have an ID for the server administrator, create one.

Password:

Enter the password for the administrator's ID. The password must be at least eight characters. Lotus recommends using a mixed-case password of at least 13 characters. If you select to use an existing administrator ID, you must specify the file name of that ID.

4. Select the appropriate option from the Time Zone Settings section:

Local time zone: Select the local time zone for this server.

Daylight savings time: Select if daylight savings time is observed.

5. Once you have chosen administration settings, click the right arrow, and go to 3.2.7, "Choosing network and communications options" on page 75.

3.2.5 Configuring an additional domain server

If you want to configure an additional server, select **Additional Domino Server** from the 1. Create a New Domino Server page (see Figure 14).

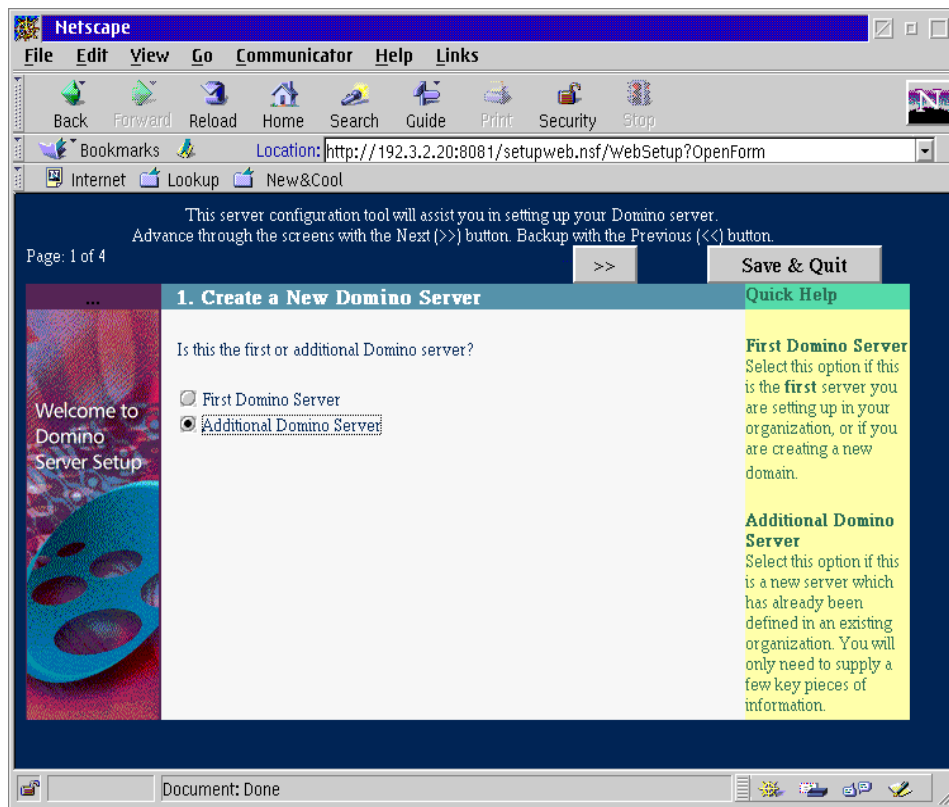


Figure 14. Domino configuration: Create an Additional Domino Server

3.2.6 Choosing administration settings for the additional server

After completion of the 2. Server Audience page, fill in the necessary information on the 3. Administration Settings page (shown in Figure 15).

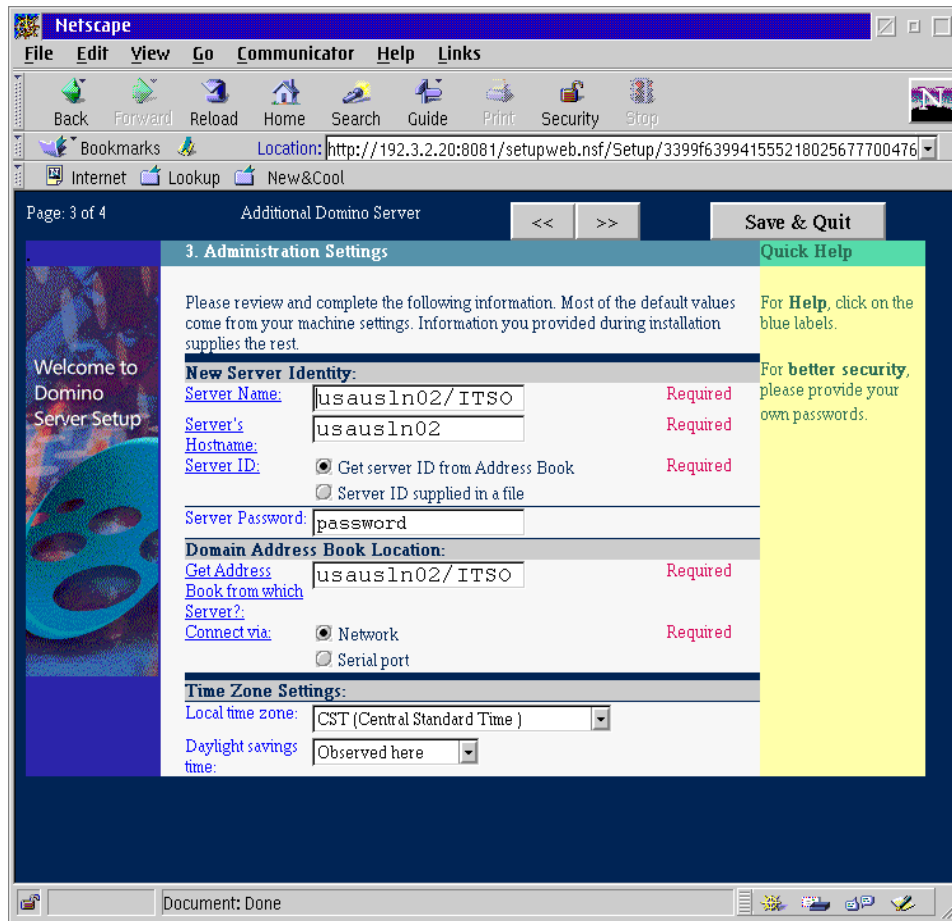


Figure 15. Domino configuration: Settings for the Additional Domino Server

Complete the following steps:

1. Type the necessary information in the New Server Identity section:

Server Name: Enter a server name, for example, usausln01/ITSO (ITSO is certifier name). This is the name of the new Domino server. Users and other servers access the server using this name.

Server's Hostname: Enter the TCP/IP hostname of the server. The HOSTNAME environmental variable holds this value on the server.

Server ID: Select whether to create a new server ID or use an existing one. If your organization does not yet have a Domino server ID for this server, create a new one. If you select to use an existing Domino server ID, enter its password and file name.

Password: Enter a server ID password. The password must be at least eight characters.

2. Type the necessary information in the Domain Address Book Location section:

Get Address Book from which Server?

Enter a fully qualified server name. This is the name of the Domino server that has the Address Book for this domain.

Connect via: Select if the server is connected through the Network or the Serial port (Dialup).

3. Select the appropriate option in the Time Zone Settings section:

Local time zone: Select local time zone for this server.

Daylight savings time: Select if daylight saving time is observed.

3.2.7 Choosing network and communications options

You can change the default network and communications settings in the fourth page, Network and Communications Settings, shown in Figure 16 on page 76. For Help on what terms mean, click the underlined blue labels (for example, Server Name) and hold down the mouse button to read the Help.

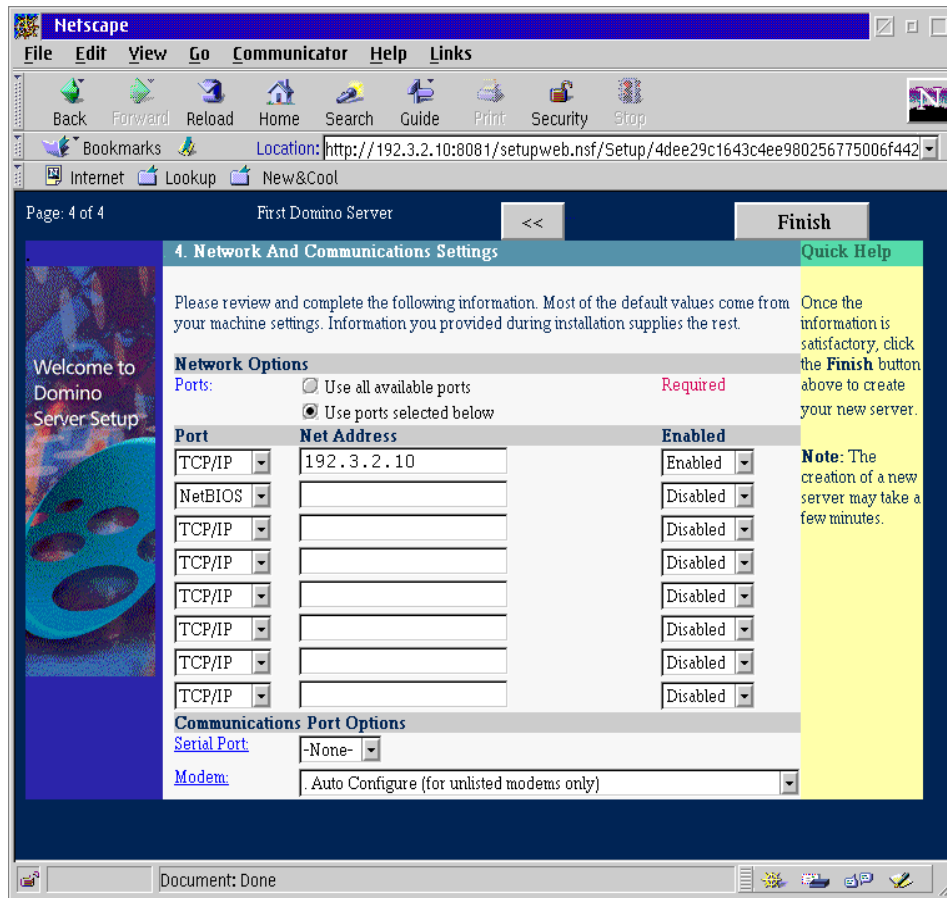


Figure 16. Domino configuration: Network And Communications Settings

To select network and communications settings, do the following:

1. Select an appropriate option from the Network Options section.

Select whether to use all available ports or to select ports. If you choose to select ports, do the following for each port: Choose a protocol by clicking the down arrow, selecting a protocol, and clicking **OK**. Enter a network address. Network addresses must be resolved by each protocol support layer. Click the down arrow and select to enable or disable the port.

Note

If you configured NetBIOS or NetBIOS over TCP/IP protocol, the setup program automatically detects the ports already configured. For an OS/2 system, the following ports will appear:

- TCP/IP – The port names are TCPIP, TCPIP2, and so on.
- NetBIOS – The port names are LAN0, LAN1, and so on.
- NetBIOS over TCP/IP – The port names are LAN0ip, LAN1ip, and so on.

2. Select the options from the Communications Port Options section.
Choose a serial port by clicking the down arrow, selecting a serial port, and clicking **OK**.
Choose a modem by clicking the down arrow, selecting a modem, and clicking **OK**.
3. Click the **Finish** button to start the configuration process on the server.
After successful processing, the page shown in Figure 17 on page 78 appears. Press **Exit** to finish the configuration tasks from a Web browser.

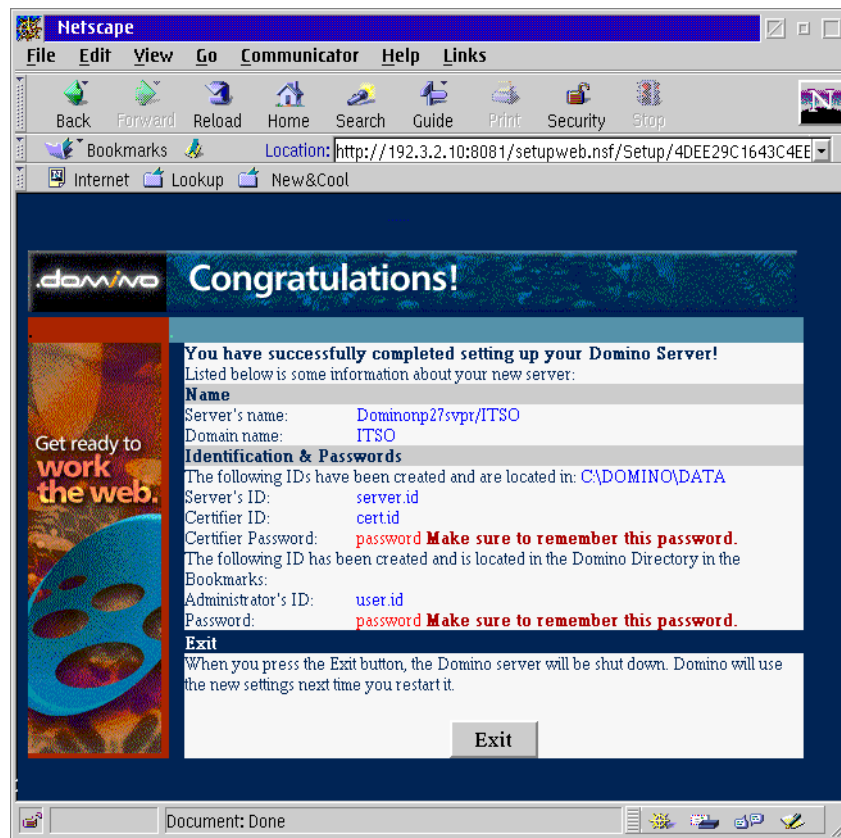


Figure 17. Domino configuration: Successful completion message

At this point, the setupweb.nsf file is deleted on the server.

3.2.8 Post installation tasks

After the installation, in some cases, you have to change your system configuration, including the Domino R5 system itself.

3.2.8.1 Loading the HTTP Task

If you did not select the HTTP server task in Figure 12 on page 67, the HTTP server task can be enabled after the server configuration. It can be loaded manually or set to start automatically every time the Domino server starts. To start the HTTP task on the server, enter the following command at the Domino server console:

```
load http
```

To automatically enable HTTP services every time the Domino server starts, follow these steps:

1. Open the server notes.ini file using a text editor.

Locate the ServerTasks parameter in the file, for example:

```
ServerTasks=Router, Replica, Update, Amgr, AdminP, Stats, maps
```

2. Add the HTTP server task definition in the server task list. Note that the Domino server loads the tasks in the order they appear in the notes.ini file. To make databases available to Web clients as soon as possible after the server startup, add the HTTP task right after the Router task, as shown below:

```
ServerTasks=Router, HTTP, Replica, Update, Amgr, AdminP, Stats, maps
```

3. Save the changes. The HTTP task will automatically load the next time the server is restarted. To load the HTTP task manually, enter the following command at the Domino server console:

```
load http
```

When the HTTP server task is started for the first time on the server, the webadmin.nsf database is automatically created.

3.2.8.2 Swapper.dat location setting

If you changed the *swappath* parameter in the config.sys file, you have to change the swappath statement in the notes.ini file to have the Reporter or Collector task on the server work correctly.

This specifies the location of the server's swap file. If this setting exists in the notes.ini file, the Reporter or Collector server task uses this location for the Server.Path.Swap statistic. If this setting is omitted, Domino looks for the location of the swap file in c:\os2\system.

3.2.8.3 Lotus Domino Go Webserver coexistence

Lotus Domino Go Webserver uses Version 4.6.1, which supplies all of the functions of v4.6.2.6 except for the updated Secure Socket Layer, which Domino does not use. In order to prevent a collision on servers that already have Lotus Domino Go Webserver 4.6.2.6 installed, the use of the -noapi parameter is required when Webserver 4.6.2.6 is launched. Otherwise, error messages similar to the one below appear in the Webserver error log:

```
Serverinit Error: server did not load functions from DLL module  
d:/WWW/DLL/servlet.dll
```

The -noapi parameter prevents two DLLs with additional API support from being loaded. Since the DLLs will not have been loaded, the LIBPATH will be

searched when Domino 5 makes a call and, assuming the LIBPATH is in the correct order, the correct DLLs will be found.

3.3 Starting the Domino R5 server

After configuring the Domino server, the HTTP server will automatically terminate. To start the server again, follow the instructions below.

3.3.1 Starting from the desktop icon

To start the Domino R5 server from the desktop icon, complete the following steps:

1. Open the **Lotus Application** folder on the desktop.
2. Double-click the **Lotus Domino Server** icon shown in Figure 18.



Figure 18. Lotus Applications folder: Lotus Domino Server icon

3. Wait for initialization completion on the server.
4. Start a Web browser on any machine and type the following URL to connect the Domino server (see 8.1, "Using the Domino Web Administrator" on page 253 for browser information). For example:

`http://IPaddress`

IPaddress is server's IP address.

Or

`http://hostname`

hostname is a hostname of the server.

5. A Web page will be displayed on the browser as shown in Figure 19 on page 81.

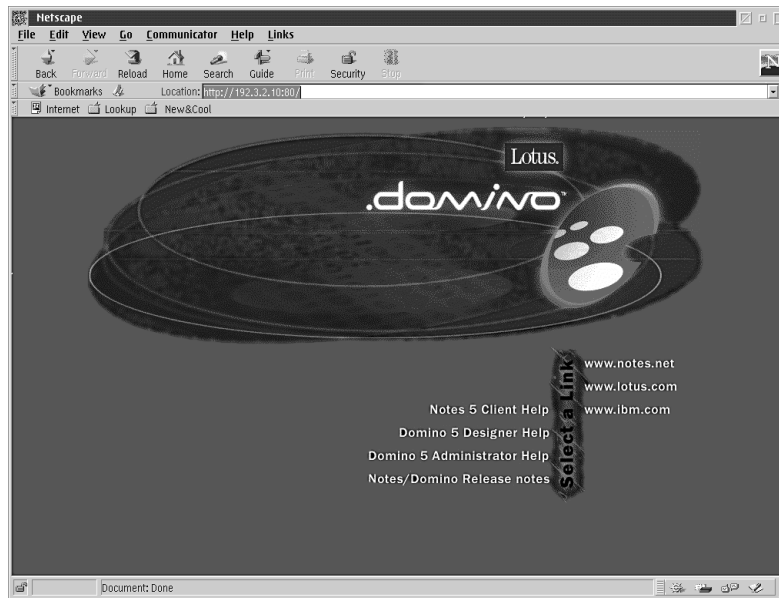


Figure 19. Domino configuration: Domino HTTP server default page

3.3.2 Starting from the OS/2 command prompt

To start the Domino R5 server from the OS/2 command prompt, do the following:

1. Open an OS/2 window or OS/2 Full Screen.
2. Move to a Domino R5 directory, for example, d:\domino.
3. Type the `iserver` command from the command prompt:

```
[d:\domino] iserver
```

Chapter 4. Migrating from Domino R4.5 and R4.6

This chapter provides an overview of a suggested procedure for upgrading your Domino R4 environment to R5 and includes the following topics:

- Planning for a migration
- Migrating the Notes Clients
- Upgrading the Domino servers
- Upgrading the Mail servers
- Upgrading databases and applications

4.1 Planning for a migration

In this section, we discuss a possible migration path for you.

4.1.1 Determining your business needs

Before moving to Domino R5, you should determine your business requirements for the upgrade and formulate a comprehensive business case. There are many additional features and performance benefits. However, you should determine if these additional features are required. If the business requirements for implementing specific features are not compelling, perhaps you should wait for a new release, or until your environment requires these new features.

Although R5 includes many new features, only some features require major changes to your actual R4 environment. These include:

- Updated database file structure
- Enhanced migration and directory services
- Enhanced SMTP configuration and messaging
- Virtual Web servers
- Internet cluster manager
- TCP/IP protocol usage
- New Administration client
- New end-user client

The Administration client and the end-user interface in Notes R5 are substantially different from R4. The Administration client uses a new interface that allows for graphical representation of the environment, as well as for drag-and-drop database and server management. Like the Administration client, the new Notes Client R5 is completely revised. Bookmarks, headlines, and task centers will replace the Notes R4 work space.

For those using Domino as an intranet, Internet, or extranet environment, R5 means a great deal to your business since the new release offers great enhancements in accessibility and Web performance. In Domino R5, you could easily host multiple Web sites on one Domino server and use new features, such as Web clustering, HTTP restart and in-place compaction, and the new Internet cluster manager. Adding these new R5 features means great improvements and the opportunity to re-engineer your Web environment.

The upgrade to Domino server R5 will have a major impact on your server environment. The new file structure provides better performance and manageability and the updates to the Administration Process will make your environment more reliable.

The incorporation of R5 in your environment could be rewarding and good for your business.

4.1.2 Performing a system inventory

You need to know your current Notes environment and how servers and users communicate. Your Domino servers probably perform multiple functions. You may have servers that act as mail hubs, replication hubs, mail servers, and Web servers all at the same time. You may also have some servers that are specialized for Message Transfer Agent (MTAs). And some servers may be running multiple protocols, such as TCP/IP and NetBIOS, that users connect to through LAN or dial-in.

You also need to know what applications are running in your environment and what the requirements of these applications are. You need to determine what systems are being accessed through application or migration utilities and how that access is taking place. For example, are you using tools like MQSeries or NotesPump for access to legacy systems? You need to know what could be affected by an R5 upgrade. The place to start is with a detailed application and server inventory.

4.1.2.1 Application inventory

You need to build a detailed application inventory that includes a list of the following:

- Inactive applications
- Mission-critical applications
- Web applications
- Work flow or automated applications
- External mail system(s)
- Connectivity tools

4.1.2.2 Server inventory

You should also develop a detailed server inventory that includes a list of the following:

- Server(s) function(s)
- Current server(s) and operating system software versions
- Database replication schedules and requirements
- Server-to-server communications
- User-to-server communications
- Notes domains and networks
- Current users and operating system software versions
- Memory configuration
- Disk configuration and free spaces

Once you have completely detailed your current application and server activities, you need to determine if your server is ready for R5.

4.1.3 Determining server readiness

Determining the state of your current environment is an extremely crucial step to a successful upgrade. Preparing your servers for an R5 upgrade could involve re-engineering the environment as necessary to handle the additional hardware and software loads of R5. Perform a detailed system audit on all servers and review all servers for performance, bottleneck, connectivity, access, and application issues. To help you determining whether your server is ready for R5, you should consult the following chapters.

- Chapter 2, “Preparing for installation” on page 25
- Chapter 5, “Optimizing your Domino environment” on page 145

4.1.4 Determining your network readiness

After you have performed a system inventory and determined the capabilities of your current servers, you can use this information to determine what re-engineering tasks you want to complete as part of your R5 upgrade. Some re-engineering steps to consider are:

- Incorporate clustering
- Incorporate partitioning
- Introduce the TCP/IP protocol if not installed already
- Incorporate other protocols or remove protocols
- Incorporate additional connectivity methods
- Move to a topology hub/server
- Consider migrating you server operating systems from OS/2 Warp Server V4 to OS/2 Warp Server for e-business

- Rename servers
- Redefine organizational unit
- Redefine organization certifiers
- Database distribution

These steps require considerable time on an existing Domino server, but may result in an improved Domino network design.

4.1.5 Creating an upgrade plan

A clear and thoughtful plan will ensure a good upgrade to Domino R5. This plan needs to be in place before the beginning of the upgrade process. As you develop your plan, consider the impact of the changes, such as moving current R4 users to the WebMail client (Chapter 6, “Using the browser (WebMail) client” on page 197), or to a Windows-based Notes R5 Client. The best strategy is to start upgrading the Domino server environment to R5, making sure that the environment is completely stable, and then implement and take advantage of the new features.

Use the skills of your Notes administrators and support staff to create the upgrade plan. This plan should include the order of operations for your organization — which servers to upgrade first, then which clients (for example, by department or geographic location), then which applications (for example, performance-critical applications first). Each major phase during the upgrade plan should be a milestone and assigned a fixed completion date.

Set procedures

Document the steps your team will take to upgrade servers, clients, and applications. Use the procedures in this guide as a starting point. If your organization customized the Public Address Book, for example, add a step at the end of your upgrade to apply those changes to the new Domino Directory template. Be sure to include troubleshooting information, procedures for backing up key files, ways to notify users that a server will be unavailable or that their client will be upgraded, and contact information for questions.

Establish strategy

Publish the major milestones of the plan in a database for use as a knowledge repository, include capturing data, issues, solutions, and feedback. This database will be the starting point for creating a set of guidelines, procedures, and knowledge that represents the best way to upgrade to R5 in your organization. By capturing feedback as you upgrade,

your team can shift its operations or order of events to better meet the organization's needs.

Set responsibilities Assign clearly defined roles and responsibilities to designate who performs which functions at what times. Make sure you include dependencies to related steps in your task assignments, and plan to overlap tasks that can be performed concurrently. For example, your Domino administrators might be responsible for upgrading hub servers in the next week, followed by upgrading mail servers over the next four 4 weeks. Ensure that there is a contact person for each role and responsibility — this person should be one of the members of the upgrade team.

Plan for training Notes administrators and support staff members should receive full training on the new R5. They should learn how to use the administration and end-user interface, what components have been updated, and how to access new features. A knowledgeable staff is a prerequisite for a planned and efficient upgrade. Plan how to train users in the new Notes Client interface and inform them how the migration may affect their daily routines. While the interface is easy to use, especially for users accustomed to Web browsers, it is different from the earlier Notes interfaces. R4 users can continue to use the work space, but the new Bookmarks navigation model offers new features and ease of use.

Examine hardware and software needs

Consider whether upgrading involves hardware or software changes. For example, if your organization uses OS/2 Warp Server 4 SMP, and you want to upgrade to OS/2 Warp Server for e-business, you must upgrade before moving to Domino R5. You may need additional hardware to take full advantage of R5 features. For example, the transactional log files should be stored on a separate dedicated drive for best server performance, and the Domain Catalog Server that performs domain-wide searches should be a powerful, dedicated machine. Examine your infrastructure and the R5 features you wish to implement, and determine whether additions or changes are necessary.

4.1.6 Upgrade steps

You need to determine early the order in which you plan to perform the upgrade. The upgrade needs to be an organized process to minimize work and avoid disrupting users. Server upgrades, for example, should take place at times when few users are connected. Your upgrade will be smoother if you upgrade your full production environment to R5 before using new features.

The R5 upgrade strategy should follow this order:

1. Install a Notes R5 Administration client for Windows, as discussed in 7.2, "Installing and configuring the Domino Administrator for Windows" on page 226.
2. Upgrade the administration server of the Public Address Book to R5.
3. Upgrade the Public Address Book design.
4. Upgrade hub servers.
5. Upgrade spoke servers.
6. Upgrade clients.
7. Upgrade applications.
8. Enhance applications to take advantage of new functionality.

If you follow this strategy, you will first upgrade the components that will have the greatest impact on your environment. First migrate the server environment (including applications) and then migrate the clients. Upgrade servers starting with hubs, progressing to mail and applications servers. Start locally with local and domestic sites, then move globally to remote and international sites.

4.1.6.1 Create a pilot upgrade project

Before upgrading to R5, your first crucial step should be a pilot installation. You should create a non-production environment where you can test things and gain experience. If completed correctly, a pilot installation of R5 should map out the best path for full implementation, as well as flag any potential problems. It is also essential that you test databases and applications on an R5 environment before you move them to R5.

Begin with a pilot installation that reproduces, on a smaller scale, all aspects of your current Domino environment. A proper pilot installation could mean success or failure to the entire upgrade. If a system fails to function under the R5 pilot, your administrative and support staff should be able to notice it immediately. By determining the cause of the pilot errors, they can develop a plan to eliminate them during the production implementation. End-user

feedback is another important piece of the pilot implementation. Keep track of errors encountered when upgrading applications or using new features, as well as any troubles users have with the new interfaces. Document all administrator and end-user suggestions.

You should determine which R5 features are required and how they should be implemented. After the feature selections have been completed, you should create a detailed pilot implementation plan. Make sure your implementation plan includes the following information:

- Timelines
- Steps for server upgrades and installations
- Steps for client upgrades and installations
- Detailed application listing for tests
- Test plan for new features, applications, and connections
- Test plans for add-in tasks and other utilities
- Assigned roles/responsibilities for each task

The pilot implementation plan will be the draft of a production implementation. Make sure this plan is kept up to date. Create a list of Notes and Domino databases and features that are mission-critical for your organization. This lets you accumulate knowledge and create the best practices for the deployment of your organization.

In large companies, consider an initial limited-scale deployment to one group or business unit that serves as a model for the rest of the organization. Use this deployment of R5 along with your pilot project. Think of this deployment as a beta release of your upgrade plan. It allows you to test your plan under actual business conditions. This type of deployment may not be necessary in small companies, who have fewer issues regarding scalability, or for companies who need a quick upgrade to R5.

4.1.7 Checking prerequisites

You need to know all the R5 prerequisites before starting the upgrade.

4.1.7.1 Operating system

In R5, the Notes Client is no longer available for MS Windows 3.1, IBM OS/2 Warp, or UNIX systems. Notes users with those operating systems can continue to run an earlier version of Notes, move to a WebMail client-based environment, or move to a platform that has a Release 5 client, such as, MS Windows 95, Windows 98, Windows NT, or Macintosh PowerPC systems.

Domino server R5 is available on IBM OS/2 operating systems. See 2.2, “Software requirements” on page 28.

4.1.7.2 Hardware

Be sure to consult the Release Notes (readme.nsf) for hardware requirements for Domino and Notes R5. The Release Notes contain critical technical information, documentation, interoperability issues, and updates that were not available in time to be included in the rest of the documentation. You may need to add additional capacity to servers or workstations to run R5. In addition, features, such as transaction logging, have additional requirements such as separate drives.

4.1.7.3 Domino R4 server

To upgrade to R5, your Domino and Notes system should be running Release 4.1 or later. Lotus recommends upgrading a R4 system to the latest Quarterly Maintenance Release (QMR) of that release for the greatest stability and ease of upgrading. For example, upgrade a Release 4.6.1 system to Release 4.6.3a.

4.2 Migrating the Notes Clients

You may want to continue using your current Notes R4 Clients with Domino R5 server if you remain at R4 templates. No changes need to be made to the client. Again, the most important thing is not to upgrade the mail file database design to the R5 design, but stick to R4 templates. The new R5 mail file design uses several new features, for example, framesets, outlines, and pages, and Notes R4 cannot display these design elements.

Important

Always use the Notes R4 mail template with Notes R4 Clients even though the mail file may be located on a Domino R5 server.

You may experience problems if the sender uses an R5 mail template and the receiver uses Notes R4 Client. Some of the new elements may not display properly. For example, new 3D tables may not display properly on R4 clients.

4.2.1 Using Domino R5 databases from the Notes R4.5 Client

The Lotus Domino R5 server ships with many templates, including four new database templates: Team Room, Microsoft Office Library, Document Library, and Discussion database. We tested these new database templates with

Notes R4 Client, and the conclusion is very clear: The new R5 database templates are not Notes R4-compatible.

Note

The Release 5 database templates that ship with Domino R5 server cannot be used with Notes R4 Clients. The database templates use Notes Client R5-specific features, such as framesets, pages, and outlines, that are not available on Notes R4. You need to copy the R4 database templates to your Domino R5 server and use these templates for R4 clients.

R4 applications run without modification on an R5 server and with the new R5 On Disk Structure (ODS). More information on this issue can be found in the *Domino Release 5 Release Notes*.

Hint

You can also find information on interoperability issues in the Lotus Knowledge Base at the following URL:

<http://orionweb.lotus.com/basic.html>

When you upgrade to R5 templates and features, be aware that R4 clients cannot use these features as discussed before. Using R5 templates and features in a mixed-release environment can cause complications by preventing clients' earlier releases of Notes from using the full functionality of the application.

There are three possibilities for upgrading databases and applications in the R5 environment:

- Upgrade an application server to R5, but leave databases in R4 format (ODS) using R4 design and features.

All clients can access this database without problems, and there should be no problems with the upgrade or interoperability.

- Upgrade the server and database format to R5, but leave the database design and features at R4.

All clients can access the database without issues. There should be no problems after the upgrade. Running Domino R5 server, you can support more concurrent clients on the server, and depending on the server configuration, you may see improved performance.

Use compacting to convert the databases to the new ODS. You can prevent certain databases from being converted by renaming the database

file extension from .NSF to .NS4. Compacting also supports rolling back to R4 format from R5 format. For more information on compacting and its options, see “Compact Options” in the online Help file *Domino R5 Administration Help*.

This is the recommended solution in a mixed environment. All your clients can still use applications without modifications, and on the server side, you can take advantage of the new Domino server features.

- Upgrade the server, database format, database design, and database features to R5.

In this case, R4 clients cannot use R5 features. You may need to make changes to the application to use new features. Compact the database to the new ODS, replace the R4 design with the R5 design, and add new R5 features as wanted.

4.3 Upgrading the Domino servers

Upgrading your Notes/Domino environment from Domino R4 to R5 is not an isolated exercise. You cannot simply load new software, modify some settings, reboot the server, and expect Domino R5 to work automatically.

The first thing to know is that all the features found in Domino R4 are also supported in Domino R5. This means that all of your R4 applications will run on R5 without any modifications. (Be sure to consult the Release Notes *readme.nsf* for any known incompatibility issues.) You can also run R4 and R5 servers and clients in the same environment. Domino R5 has been designed for seamless co-existence with Domino R4 to make migration as simple as possible. However, it is important to understand that Domino R5 databases are not transferable to an R4 server. The internal database structure is different for R5. You can still exchange data between Domino R4 and R5 servers by replicating, but you cannot simply copy a database file from an R5 server to an R4 server.

An R5 Domino Directory can be used by Domino R4 as its Public Address Book. Some forms contain fields that were not present in Domino R4 but these are ignored by R4 servers. The administration server for the Domino Directory should be an R5 server. To migrate the Domino Directory, replace the R4 design with the R5 design. Remember to replicate the new design to all your servers by performing: **File => Database => New copy**

R4-compliant Domino R5 Directory

The R5 Domino Directory is equivalent to a Public Address Book in R4. The new R5 Domino Directory works on Domino R4 servers as well. New fields in Directory documents are ignored on R4 servers.

After you have ungraded all the servers in your environment, you can start upgrading clients. You should not replace the R4 database or mail file templates before you have upgraded all the clients. All the Domino R5 templates are designed to take advantage of the new design elements, such as pages, framesets, and outlines. Therefore, the new templates do not work on R4 clients.

Important

Do not upgrade the database or mail file templates to the R5 design before you have upgraded all the clients. Notes R4 Clients are not capable of using the new template because of the new design elements.

The last phase is to upgrade your applications. Applications designed for Domino R4 work on R5 without modification, but if you want to take advantage of new features in R5, you need to refresh the application design. Keep in mind, though, that any application using R5-specific features may not run properly on Notes R4 Clients.

Typically, it is not necessary to purchase additional hardware to run Domino R5 if you are migrating from R4, since database sizes after the design refresh are approximately the same as before. However, to get the best from transaction logging may mean providing additional disk drives for your servers. For more information, see 5.3.6, “Transactional logging” on page 160.

4.3.1 Starting the upgrade

When you begin upgrading to R5, you may want to start with servers that will cause the least user impact, such as hub or MTA servers. Hub servers handle significant mail and replication traffic and benefit greatly from the improved performance and administration on R5. In addition, fewer users access hub servers, so any downtime for upgrading is less disruptive. Upgrading this server first will allow you to upgrade systems databases and add administrative functionality and features that may not initially affect users.

When you upgrade a Domino server from R4 to R5, you may gain features, functionality, and performance without changing your server configuration, topology, routing, or addressing. Domino will perform the required housekeeping task when the standard commands `iupdall` and `icomcompact` are issued from an OS/2 command line. These two commands update views and full-text indices and convert the file format. Domino also recreates view indices when first accessed by a client.

To upgrade a server, perform the following steps:

1. Shut down the Domino server.
2. Back up important Domino server files.
3. Update the `notes.ini` file.
4. Install the Domino Release 5 software.
5. Upgrade the administration server for the Domino Directory.
6. Upgrade the Public Address Book template.

4.3.1.1 Shutting down the Domino server

Before upgrading the server, warn users that it will be offline and unavailable until after the upgrade. Change to the Domino server console and type:

```
>quit
```

Press **Enter** to initiate the server shutdown.

4.3.1.2 Saving key Notes files

Table 9 lists important Domino server files that should be backed up before you start the upgrade process. In case you encounter errors during the upgrade, you can always go back to the original configuration.

Table 9. Saving key Notes files

File	Default Location
Notes Configuration (<code>notes.ini</code>)	Notes Data Directory (<code>c:\notes\data</code>)
Desktop Configuration (<code>desktop.dsk</code>)	
Personal Address Book (<code>names.nsf</code>)	
User ID Files (<code>*.id</code>)	
Local Databases (<code>*.nsf</code>)	
Local Templates (<code>*.ntf</code>)	
Local Database Directory Links (<code>*.dir</code>)	

4.3.1.3 Updating the notes.ini file

Remove memory management, name lookup controls, and debugging parameters from the notes.ini file. Since the reporter task no longer exists in Release 5, remove it from the file:

1. Make sure you backed up important server files. See 4.3.1.2, "Saving key Notes files" on page 94.
2. Open the notes.ini file for the server you are upgrading in a text editor such as Enhanced Editor `epm.exe`.
3. Delete the entry `Reporter` from the `ServerTasks=` line of the file.
4. If the following entries exist in the file, remove them:
 - `NSF_Buffer_PoolSize`
 - `NSF_DbCache_Maxentries`
 - `Server_Name_Lookup_Noupdate`
 - Any debugging parameters
5. Save the file.
6. Close the text editor.

4.3.2 Installing Domino R5 for migration

To install Domino R5, do the following:

1. Make sure you backed up all important Domino files and removed the reporter task from the notes.ini file. See 4.3.1.2, "Saving key Notes files" on page 94 and 4.3.1.3, "Updating the notes.ini file" on page 95.
2. Install the Domino Release 5 software as discussed in 3.1.1, "Installing Lotus Domino R5" on page 59.
3. During installation, select the server type (as shown in Figure 20) for which you purchased a license.

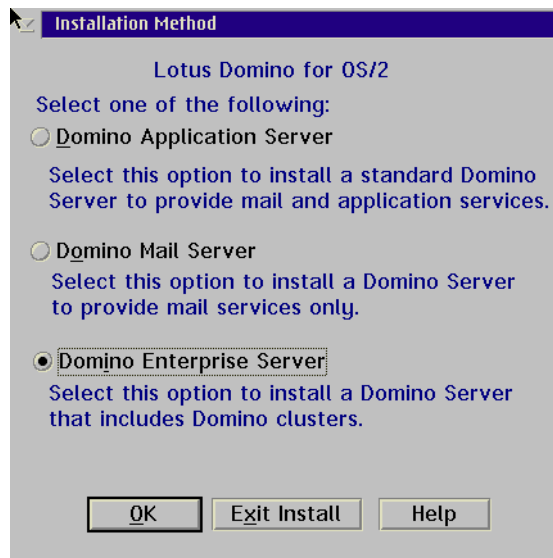


Figure 20. INSTPM: Selecting the server type

4. Make sure which directory you want to install the components to, as shown in Figure 21. If you install Domino in the same directory as the previous version, you do not need to change the server configuration. If you install Domino in a new directory, the program prompts you to configure the server.



Figure 21. INSTPM: Installation in the same directory as the previous version

5. If prompted to replace the files during the installation as shown in Figure 22 on page 97, click the **Yes to all** button to replace all files.

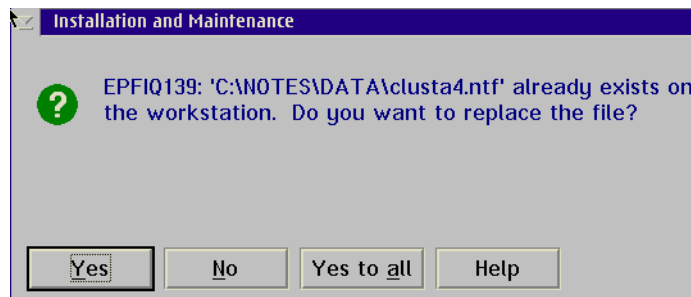


Figure 22. INSTPM: Replacing the files during installation

6. After installation, start the Domino Release 5 server. (Refer to 3.3, “Starting the Domino R5 server” on page 80.)

4.3.2.1 Upgrading the administration server for Domino Directory

After you upgrade the first Domino server in your domain and replicate the new Domino Directory template to the other servers, upgrade the server that acts as the administration server for the Domino Directory. This lets you take advantage of the new R5 Administration Process features. Follow the steps in this chapter to upgrade the administration server.

Upgrading the Administration Requests template

After upgrading the administration server for the Domino Directory, process all requests in the Administration Requests database, then shut down the Administration Process and upgrade the design of the Administration Requests database on that server to the R5 template. The R5 Administration Requests template is designed for backwards compatibility with the R4 Administration Process and for use in mixed-release environments. You can and should replicate the new design to the Administration Requests databases on your organization’s other servers.

Note

You do not need to process all the requests in the Administration Requests database to upgrade the database, but we recommend you process as many as possible for a faster upgrade.

Processing requests in the Administration Requests database

To process the request in the Administration Requests database, do the following:

1. Change to the Domino server console.
2. At the server console, type:

```
>tell adminp process all
```

Press **Enter**.

You may need to issue this command more than once, since some Administration Requests create others.

3. Once the Administration Process finishes processing requests, shut it down. At the Domino server console, type:

```
>tell adminp quit
```

Press **Enter** to terminate the Administration Process on the server.

Next steps require the Notes R5 Administration client

Make sure you have installed a Notes R5 Administration client to perform the next steps.

Upgrading the design of the Administration Requests database

To upgrade the design of the Administration Request database, do the following:

1. At the Domino R5 Administration client, choose **File => Database => Open**.
2. In the Server field, type the name of the upgraded administration server.
3. Select the **Administration Requests (R4.5)** database (`admin4.nsf`) and click the **Open** button as shown in Figure 23.

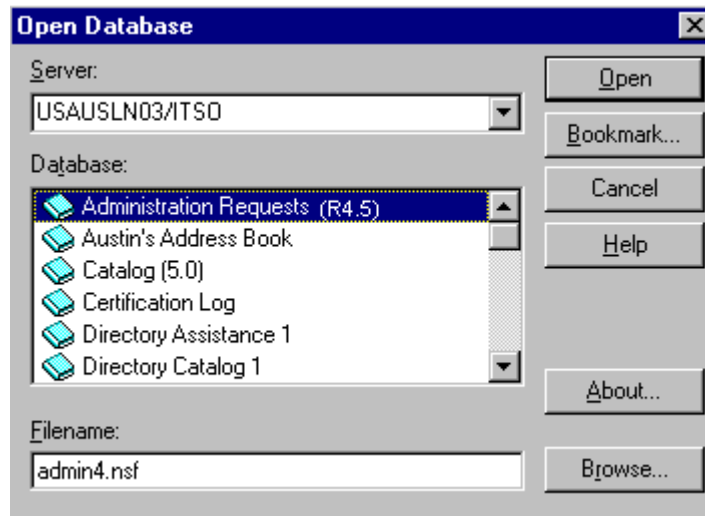


Figure 23. Domino: Selecting the Administration Request (R4) database

4. If this is the first time you have opened the Administration Requests database, you see the About This Database document. Press **Esc** to close the document.
5. Choose **File => Database => Replace Design**.
6. Click **Template Server**.
7. In the Server field, enter the name of a Domino R5 server and click the **OK** button.
8. Click **Show advanced templates**.
9. Select the **Administration Requests (R5.0)** template (`admin4.ntf`) and click **Replace** as shown in Figure 24 on page 99.

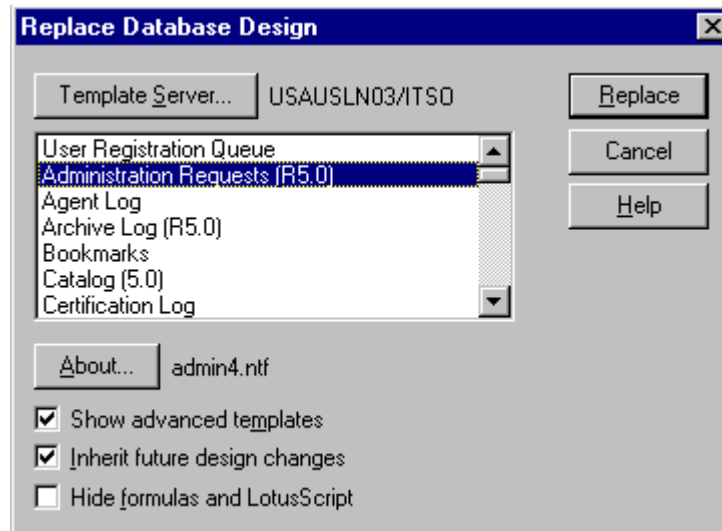


Figure 24. Domino: Selecting the Administration Request (R5.0) template

10. When the Domino Administrator displays a warning about replacing the design, click **Yes**.
11. Close the Administration Requests database.
12. Replicate the new design to the other servers in your organization.

4.3.2.2 Upgrading the Public Address Book template

In Domino R5, the Public Address Book (PAB) is now called the Domino Directory to reflect its expanded role as an Internet and intranet reference. Upgrading the Public Address Book consists of upgrading the design, as well as upgrading and reindexing the file format. The file format for databases in

R5 is different than in R4 in order to improve scalability and performance. However, this difference should have a minimal impact on your upgrade.

The Domino server prompts you to upgrade the design of the Public Address Book with the R5 Domino Directory template (pubnames.ntf) after upgrading Domino. The new Domino Directory template works with the Domino Administrator client to streamline the directory and Domino server administration. The Domino Directory is backwards-compatible and is designed for use in mixed-release environments. Upgrade the design of your address book to the Release 5 Domino Directory template once you upgrade your server to Release 5. Then, upgrade the database format of the Domino Directory by compacting the database and rebuilding its views.

Upgrading the PAB to the Domino Directory template

To upgrade the Public Address Book to the Domino template, do the following:

1. During the first launch, Domino R5 asks if you want to upgrade the Public Address Book design to the Release 5 template:

Do you want to upgrade the design of your Address Book? This replaces the standard forms and views with ones from the template. (Yes/No)

Type **Y**. This replaces the R4 Public Address Book template with the R5 Domino Directory template.

2. Once the server launches, verify that there are no errors or problems. Then, quit the server. On the Domino server console, type:

```
>quit
```

Press **Enter** to initiate the server shutdown.

Compacting the Domino Directory after upgrading

To compact the Domino Directory after upgrading, do the following:

1. From the OS/2 command line, change to the Domino program directory and compact the Domino Directory to the new R5 On Disk Structure (ODS). Type:

```
icompat names.nsf
```

Then press **Enter**.

Note

If your Domino Directory has a file name other than names.nsf, substitute the correct file name for names.nsf.

2. After you compact the Domino Directory to the new R5 database format, rebuild the (\$ServerAccess) and the (\$Users) views in the Domino Directory.

Rebuilding views in the Domino Directory

To rebuild the views in the Domino Directory, do the following:

1. From the OS/2 command line, rebuild the (\$ServerAccess) and (\$Users) views in the Domino Directory. Type:

```
iupdall names.nsf -t ($ServerAccess) -r
```

Press **Enter**. Then type:

```
iupdall names.nsf -t ($Users) -r
```

Press **Enter**.

Rebuilding the (\$ServerAccess) and (\$Users) views in the Domino Directory allows clients to access the server more quickly.

2. After you rebuild views in the Domino Directory, launch the Domino server.

Updating views in databases on the upgraded Domino server

Once the Domino server is running, type on the server console:

```
>load updall
```

Press **Enter**.

This rebuilds database views, allowing users to access the Domino Directory and other databases on the server more quickly. The amount of time updall takes to run depends on the number of databases on the server, the size of the databases, and the complexity of the views in those databases.

Replicating the Domino Directory design to other servers

Once you upgrade a server to R5, you can and should replicate the Domino Directory design to the Public Address Books on your organization's other servers. The Domino Directory is designed for use in mixed-release environments and for administering R4 and earlier servers.

Note

After replicating the new template to other servers, you must rebuild the views in the Domino Directories/Public Address Books on those servers. The view rebuild for the R5 template is time consuming. We recommend you replicate the template and rebuild the views on a weekend or during other times when the server load is low.

4.4 Upgrading mail servers

Domino supports a rich set of e-mail options, including the native Notes mail client, cc:Mail, and gateways providing connectivity to other mail environments. R5 also provides numerous performance enhancements, new features, and messaging and protocol enhancements. Users benefit from increased performance and features such as native MIME and SMTP.

The process of upgrading a mail server is the same as upgrading any Domino server. Simply upgrade the Public Address Book and install the new R5 server software. The compact and upcall tasks will automatically upgrade mail files to R5 format. Completing these steps makes the server and client components ready for R5. However, the standard mail template for R5 has been modified. You need to redesign existing mail files in order to use the new R5 template.

Wait to upgrade users' mail files to the new R5 mail template until Notes users move to R5. For users who access mail only from Post Office Protocol (POP) or Internet Message Access Protocol (IMAP) and clients, such as Netscape Communicator, you can upgrade their mail files to the R5 template immediately.

This section helps you to upgrade your Message Transfer Agent (MTA) environment to the new SMTP native mail router.

4.4.1 Upgrading a server that uses the MTA gateway to R5

Domino R4 servers use SMTP MTA, a proprietary mail gateway server, to route Internet mail. In Release 5, the Domino router routes Internet mail with native SMTP. Mail clients can use Internet mail with MIME or Notes Mail in Notes format. Domino routes both formats natively and converts automatically between them without the need for a separate gateway.

To upgrade a server that uses the R4 MTA gateway to R5, you should follow the upgrade path below:

1. Back up important files.
2. Disable the SMTP/MIME MTA housekeeping.
3. Shut down the Domino router task.
4. Shut down the inbound transport of messages.
5. Clear the smtp.box.
6. Clear messages from the outbound MTA queue.

7. Clear messages from the inbound MTA queue.
8. Shut down the MTA server.
9. Update the notes.ini file of the server.
10. Install the Domino R5 software.
11. Upgrade the Public Address Book.
12. Set the server configuration for the Internet mail server.
13. Enable the SMTP listener task in the Server document for the Internet mail server.
14. If the upgraded server is the administration server for the domain's Domino Directory, upgrade its Administration Requests database.

Note

Note the following considerations:

- Domino automatically upgrades mail.box to the R5 database format and design. Any messages in mail.box are preserved.
- Given the time it may take to clear messages from the inbound and outbound queues, we recommend you upgrade an MTA server at nonpeak times, such as weekends. The MTA is unavailable while you clear the queues and upgrade it, affecting Internet mail delivery, routing, and performance.
- When the SMTP is down, Internet messages are not routed and the sender may receive error messages.

4.4.1.1 Backing up files on an MTA server

Back up important Domino server files in case you encounter errors during the upgrade. If you have problems while upgrading, you can use the backed-up copies to restore your files.

1. Back up the Notes data directory on your server (for example, d:\notes\data). This backs up desktop.dsk, all ID files (including the server ID and certifier IDs), log.nsf, names.nsf, mail.box, and any other Public Address Books located on the server.
2. Back up the contents of any directories or databases pointed to by links (.DIR files) from your data directory.
3. Back up the notes.ini file for the server. This file is located in the Notes data directory by default (for example, d:\notes\data).
4. Back up any other Notes databases (.NSF) or Notes templates (.NTF).

Note

If you have a large amount of data, you have to use the tape back up method.

4.4.1.2 Disabling SMTP/MIME MTA housekeeping

Before upgrading an R4 MTA server, disable MTA housekeeping. If you do not disable housekeeping, and you clear the message queues during a time when the compact task is set to run (2 am by default), the MTA turns itself off, performs housekeeping tasks, and then turns itself on. This enables inbound and outbound transport, undoing the work of clearing the queues.

To disable MTA housekeeping, complete the following tasks:

1. Make sure you backed up the MTA server files. See 4.4.1.1, "Backing up files on an MTA server" on page 103.
2. Launch the Domino R4 Administration client from which you administer the MTA server.
3. Choose **File => Database => Open**.
4. In the Server field, type the name of the SMTP/MIME MTA server and click **Open**.
5. Select the Public Address Book for the MTA server's domain and click **Open**.
6. In the Public Address Book, open the Server/Servers view by expanding the views under Server in the left pane and clicking **Servers** or by choosing **View => Servers => Other**, selecting **Server/Servers**, and clicking **OK**.
7. Select the Server document for the MTA server.
8. Click the **Edit Server** button on the Action bar.
9. Expand the Internet Message Transfer Agent (SMTP MTA) section.
10. Under Control, click the down arrow next to move to the Enable daily housekeeping field.
11. Select **Disable** and click **OK** as shown in Figure 25.

(SMTP MTA)

Control

Poll for new messages every:	120 seconds
MTA work path:	
Log level:	Normal
Enable daily housekeeping:	Disable
Perform daily housekeeping at:	01:00 am

Figure 25. Domino: Disabling the daily housekeeping

12. Click the **Save and Close** button on the Action bar.

13. Close the Public Address Book.

4.4.1.3 Shutting down the router task

Shut down the router to keep other servers from routing outbound messages to the MTA:

1. Make sure you disabled MTA housekeeping. See 4.4.1.2, “Disabling SMTP/MIME MTA housekeeping” on page 104.
2. Change to the Domino server console and type:

```
>tell router quit
```

Press **Enter**. The server shows the router task shutting down.

Shutting down the router prevents it from transferring more messages to smtp.box and lets the MTA empty the outbound queue by processing existing messages. Incoming messages are held in mail.box and processed by the server after you upgrade it to Release 5.

4.4.1.4 Shutting down the inbound transport of messages

Shutting down the inbound transport prevents the MTA from receiving SMTP messages addressed to recipients in your organization. This allows you to clear the Inbound and Outbound Work Queues. Complete the following steps:

1. Make sure you shut down the router. See 4.4.1.3, “Shutting down the router task” on page 105.
2. At the Domino server console, type:

```
>tell smtpmta stop inbound transport
```

Press **Enter**.

The server shows the open Inbound Session Controllers and the Inbound Session Controller task (ISESCTL) shutting down.

The inbound transport moves messages into the Inbound Work Queue (smtpibwq.nsf). Stopping inbound transport prevents the MTA from accepting inbound SMTP connections.

4.4.1.5 Clearing smtp.box

After shutting down the router task and the inbound transport, wait for the MTA to process all messages in smtp.box before proceeding.

To verify that smtp.box has no active messages, do the following:

1. Make sure you shut down the router and the inbound transport. See 4.4.1.3, “Shutting down the router task” on page 105 and 4.4.1.4, “Shutting down the inbound transport of messages” on page 105.
2. Switch to the Domino R4 Administration client.
3. Open the smtp.box database. Choose **File => Database => Open**
4. In the Filename field, type: `smtp.box`
5. Click the **Open** button.
6. If this is the first time you have opened the database, you see the About This Database document. Press **Esc**.
7. If there are any messages marked Pending Conversion or Pending Transmission, wait for them to be processed and cleaned up by the Delivery Report Task (DRT).
8. Verify message processing by pressing **F9**, or choosing **View => Refresh**; processed messages are removed from the view.
9. Once the view is empty, or contains only documents marked Dead, smtp.box is clear as shown in Figure 26.

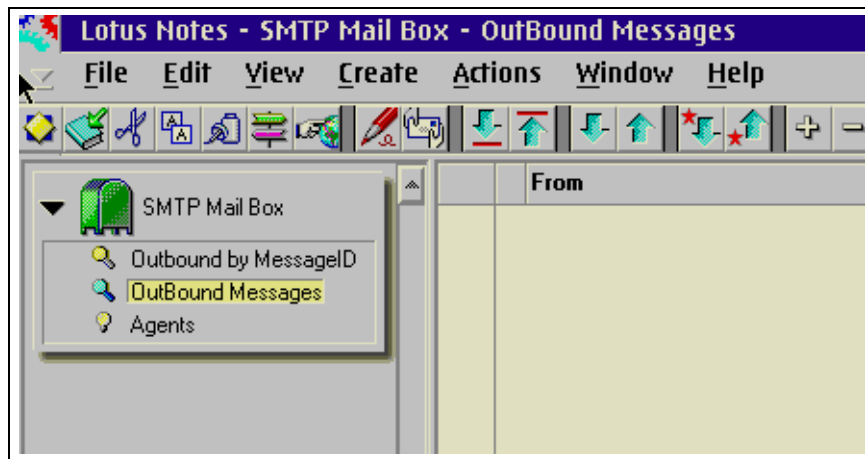


Figure 26. Domino: A clear SMTP Mail Box

10. Press **Esc** to close smtp.box.

There may be some delay between message processing and the DRT removing the message from the view due to the cycle time of the DRT.

4.4.1.6 Clearing the outbound MTA queue

Clearing the Outbound Work Queue routes all remaining outbound SMTP messages to their destinations. To clear the Outbound Work Queue, do the following:

1. Make sure smtp.box is clear. See 4.4.1.5, "Clearing smtp.box" on page 106.
2. Switch to the Domino R4 Administration client.
3. Open the Outbound Work Queue (smtpobwq.nsf) database. Choose **File => Database => Open**.
4. In the Filename field, type: `smtpobwq.nsf`
5. Click the **Open** button.
6. If this is the first time you have opened the database, you will see the About This Database document. Press **Esc**.
7. Wait until all messages in the Outbound Work Queue are successfully processed by the MTA. There should be either no messages in the view or only messages marked Dead.

8. Verify that all messages except those marked Dead are processed by pressing **F9** or choosing **View => Refresh**. Processed messages are removed from the view by the DRT as shown in Figure 27.

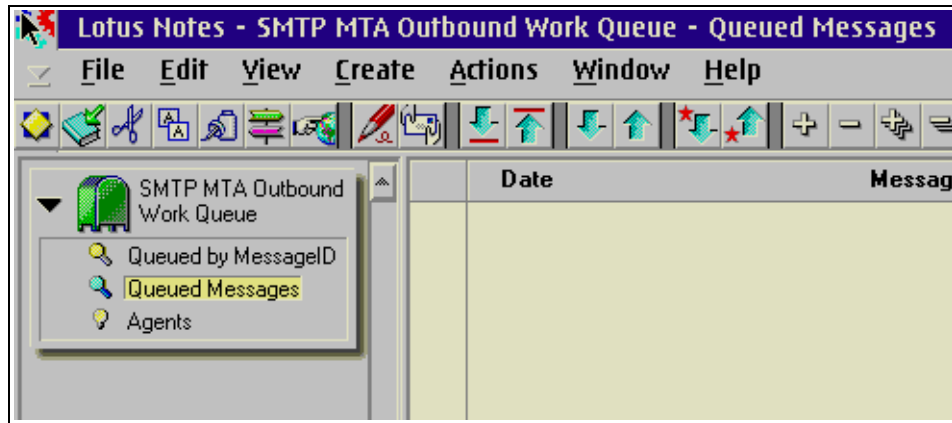


Figure 27. Domino: A clear SMTP MTA Outbound Work Queue

9. Press **Esc** to close the Outbound Work Queue.

There may be some delay between message processing and the DRT removing the message from the view due to the cycle time of the DRT.

4.4.1.7 Clearing messages from the inbound MTA queue

Clearing the Inbound Work Queue moves all SMTP messages addressed to recipients in your organization out of the Inbound Work Queue, so they can be delivered. Messages in mail.box are delivered after the server is upgraded and restarted. Complete the following steps:

1. Make sure you cleared the Outbound Work Queue. See 4.4.1.6, "Clearing the outbound MTA queue" on page 107.
2. Switch to the Domino R4 Administration client.
3. Open the smtpibwq.nsf database. Choose **File => Database => Open**.
4. In the Filename field, type: smtpibwq.nsf
5. Click the **Open** button.
6. If this is the first time you have opened the database, you see the About This Database document. Press **Esc**.
7. Wait until all messages marked Pending Conversion are processed. Verify that all messages except those marked Dead are processed by pressing

F9 or choosing **View => Refresh**. Processed messages are removed from the view by the DRT as shown in Figure 28.

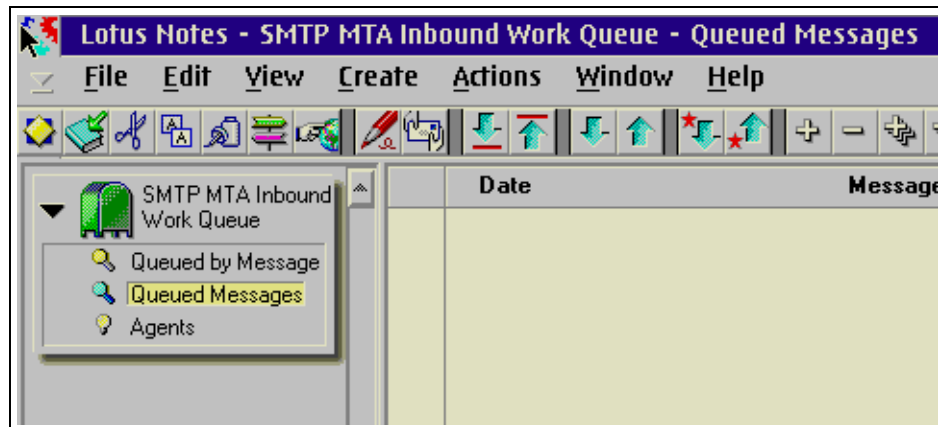


Figure 28. Domino: A clear SMTP MTA Inbound Work Queue

8. Press **Esc** to close the Inbound Work Queue.

There may be some delay between message conversion/transmission and the DRT removing the message from the view due to the cycle time of the DRT.

4.4.1.8 Shutting down the MTA server

After clearing messages from the MTA, shut it down and upgrade the server:

1. Make sure you cleared the Inbound Work Queue. See 4.4.1.7, “Clearing messages from the inbound MTA queue” on page 108.
2. To switch to the Domino server console, type:

```
>quit
```

Press **Enter**.

3. Switch to the Domino R4 Administration client.
4. Choose **File => Exit Notes**.

4.4.1.9 Updating the notes.ini file on Internet mail server

After you upgrade to Domino Release 5, you no longer need to load or run the SMTP/MIME MTA since Release 5 provides native SMTP transport and MIME handling. Remove memory management, name lookup controls, and debugging parameters from the notes.ini file. Since the reporter task no

longer exists in Release 5, remove it from the file. To remove the reporter task, do the following:

1. Make sure you backed up all important server files. See 4.4.1.1, "Backing up files on an MTA server" on page 103.
2. Open the notes.ini file for the server you are upgrading in a text editor such as OS/2 Enhanced Editor, `epm.exe`.
3. Locate the `ServerTasks=` line in the notes.ini file and delete the entries `Reporter` and `SMTPMTA` from the line.
4. If any of the following entries exist in the file, remove them:
 - `NSF_Buffer_PoolSize`
 - `NSF_DbCache_Maxentries`
 - `Server_Name_Lookup_Noupdate`
 - Any debugging parameters

4.4.1.10 Installing Domino R5 on an MTA server

To install Domino R5 on an MTA server, do the following:

1. Make sure you backed up all important Domino files. See 4.4.1.1, "Backing up files on an MTA server" on page 103.
2. Make sure you followed the procedures to clear messages from the MTA, beginning with disabling the SMTP/MIME MTA housekeeping.
3. Install the Domino Release 5 software. If you install Domino in the same directory as the previous version, you do not need to make any changes to the server configuration. If you install Domino into a new directory, the program prompts you to configure the server.
4. During installation, select the server type for which you purchased a license. For many organizations, this involves installing a Domino Mail Server on your MTA server.
5. After installing R5, launch the Domino server.

4.4.1.11 Upgrading the PAB for an Internet mail server

The Domino server prompts you to upgrade the design of the Public Address Book with the R5 Domino Directory template (`pubnames.ntf`) after upgrading. The new Domino Directory template works with the Domino Administrator client to streamline directory and server administration. The Domino Directory is backwards-compatible and is designed for use in mixed-release environments. Upgrade the design of your address book to the Release 5 Domino Directory template after you upgrade your server to Release 5. Then

upgrade the database format of the Domino Directory by compacting the database and rebuilding its views.

Upgrading the PAB to the Domino Directory template

To upgrade the Public Address Book to the Domino Directory template, do the following:

1. When Domino asks if you want to upgrade the Public Address Book design to the Release 5 template, click the **Yes** button. This replaces the R4 Public Address Book template with the R5 Domino Directory template.
2. Once the server launches, verify that there are no errors or problems. Then, at the Domino server console, quit the server by typing:

```
>quit
```

Press **Enter**.

Compacting the Domino Directory after upgrading

To compact the Domino Directory after upgrading, do the following:

1. From the OS/2 command line, change to the Domino program directory and compact the Domino Directory to the new R5 On Disk Structure (ODS), type:

```
iconcompact names.nsf
```

Press **Enter**.

Note

If your Domino Directory has a file name other than names.nsf, substitute the correct file name for names.nsf.

This moves the Domino Directory from the R4 ODS to the R5 ODS.

2. After you compact the Domino Directory to the new R5 database format, rebuild the (\$ServerAccess) and the (\$Users) views in the Domino Directory.

Rebuilding views in the Domino Directory

To rebuild the views in the Domino Directory, do the following:

1. To rebuild the (\$ServerAccess) and (\$Users) views in the Domino Directory, from the OS/2 command line, type:

```
iupdall names.nsf -t ($ServerAccess) -r
```

And press **Enter**.

Then type:

```
iupdall names.nsf -t ($Users) -r
```

And press **Enter**.

Rebuilding the (\$ServerAccess) and (\$Users) views in the Domino Directory allows clients to access the server more quickly.

2. After you rebuild views in the Domino Directory, launch the Domino server.

Updating views in databases on the upgraded Domino server

To update views in databases on the upgraded Domino server, do the following:

Once the Domino server is running, type at the Domino server console:

```
>load updall
```

Press **Enter**.

This rebuilds database views, allowing users to access the Domino Directory and other databases on the server more quickly. The amount of time Updall takes to run depends on the number of databases on the server, the size of the databases, and the complexity of the views in those databases.

Replicating the Domino Directory design to other servers

Once you upgrade a server to R5, you can and should replicate the Domino Directory design to the Public Address Books on your organization's other servers. The Domino Directory is designed for use in mixed-release environments and for administering R4 and earlier servers.

Note

After replicating the new template to other servers, you must rebuild the views in the Domino Directories/Public Address Books on those servers. The view rebuild for the R5 template is time consuming. Lotus recommends you replicate the template and rebuild the views on a weekend or during other times when the server load is low.

4.4.1.12 Setting Server Configuration for an Internet mail server

You must enable native SMTP routing in the Server Configuration document to allow the upgraded mail server to route mail using SMTP. Server Configuration documents can apply to a single server, all servers in a domain, or a group of servers. Edit the Server Configuration document that applies to the upgraded server, but be aware that this modification affects any other servers that use this Server Configuration document. If necessary, create a new Server Configuration document for your Release 5 Internet mail servers.

If you do not have Server Configuration documents for your Domino servers, create them to reflect your Release 5 configuration. For example, if you have a mail server, an application server, and a firewall server, and only the mail server will use SMTP routing, create two Server Configuration documents: one for the mail server with SMTP routing enabled, and one for the application and firewall servers without SMTP routing enabled. Complete the following steps:

1. Make sure you upgraded the design of your Public Address Book to the Domino Directory template.

Note

The Domino Directory for the domain must use the Release 5 template because the settings for native SMTP appear only in the Release 5 Domino Directory Configuration form.

2. From the Windows Domino R5 Administrator, click the **Administration** tab.
3. Click the **Configuration** tab.
4. Expand the Server Configuration section.
5. Click **Configurations**.
6. If you have a Server Configuration document that you want to use for this server, select it and click **Edit Configuration**. If not, click **Add Configuration**.
7. If you are creating a new configuration, enter a server name in the Basics section as shown in Figure 29 on page 114.

CONFIGURATION SETTINGS

Basics Router/SMTP MIME NOTES.INI Settings Administration

Basics

Use these settings as the default settings for all servers: ☐ Yes

OR

Group or Server name: usausln89/ITS02

Type-ahead: Enabled

International MIME Settings for this document: ☐ Enabled

Optimize LDAP queries: No

NOTE: This will build 4 views in the Directory

When set to 'Yes', this will allow the following:

1. Faster LDAP queries
2. Alternate language support
3. Allows exporting of objects other than people and groups

IMAP server returns exact size of message: Enabled

POP3 server returns exact size of message: Disabled

Comments:

Figure 29. Domino: Basic configuration settings for an Internet mail server

8. Select which Group or Server this configuration should apply to. Do not select Use these settings as the default settings for all servers shown in Figure 30, unless you want every server that this document controls to use SMTP to send messages to the Internet instead of through an Internet mail server.

CONFIGURATION SETTINGS: usausln80/ITS02

Basics Router/SMTP MIME NOTES.INI Settings Administration

Basics

Use these settings as the default settings for all servers: ☐ Yes

OR

Group or Server name: usausln80/ITS02

Figure 30. Domino: Use these settings as the default settings for all servers

9. Click the **Router/SMTP** tab.
10. On the Basics tab (2nd level), click the pull-down button for the SMTP used when sending messages outside of the local Internet domain field shown in Figure 31.

The screenshot shows the 'CONFIGURATION SETTINGS' window with the 'Router/SMTP' tab selected. Under the 'Basics' sub-tab, the 'Router/SMTP Basics' section contains the following settings:

Number of mailboxes:	1
SMTP used when sending messages outside of the local internet domain:	☒ Enabled v
SMTP allowed within the local internet domain:	☒ Disabled v
Servers within the local Notes domain are reachable via SMTP over TCP/IP:	☒ Always v
Address lookup:	☒ Fullname then Local Part v
Exhaustive lookup:	☒ Disabled v
Relay host for messages leaving the local internet domain:	
Local Internet domain smart host:	
Smart host is used for all local internet domain recipients:	☒ Disabled v
Host name lookup:	☒ Dynamic then local v

Figure 31. Domino: The Router/SMTP tab

11. Select **Enabled** and click the **OK** button.
12. If your organization uses a relay host, enter its host name or IP address in the field Relay host for messages leaving the local Internet domain.
13. Click the **Save and Close** button on the Action bar. If you created a document, it appears in the view.

Note

Relay host servers require additional configuration.

4.4.1.13 Editing the Server document for an Internet mail server

Edit the Server document for the upgraded server to enable the SMTP listener task that listens for inbound SMTP requests. This change tells the server to load the SMTP listener task at startup.

1. Make sure you set the server configuration to enable the server to route outbound SMTP mail. See 4.4.1.12, “Setting Server Configuration for an Internet mail server” on page 112. Remember that a Server Configuration document can apply to more than one server, so you may want to create more than one configuration document.

Note

The Domino Directory for the domain must use the Release 5 template since the settings for native SMTP appear only in the Release 5 Domino Directory.

2. From the Domino R5 Administrator, click the **Configuration** tab.
3. Expand the Server Configuration section.
4. Click **All Server Documents**.
5. Double-click the Server document for the upgraded Internet mail server.
6. Click **Edit Server**.
7. On the Basics tab, click the pull-down button for the SMTP listener task field shown in Figure 32.

Server build number:	Build V5010601
Administrators:	☐ Administrators, LocalDomainServers 
Routing tasks:	☐ Mail Routing 
SMTP listener task:	☒ Enabled 
Server's phone number(s):	☐ 
CPU count:	
Operating system:	OS/2v2 2.30
Is this a Sametime server?:	☐ No 

Figure 32. Domino: Enabling the SMTP listener task

8. Select **Enabled** and click **OK** button.
9. Click the **Save and Close** button on the Action bar.
10. Close the Domino Directory.

Note

Do not remove SMTP routing information from the Server document. Existing routing information allows you to route Internet mail in a mixed R4/R5 environment, or in a R5 environment that uses R4-style routing. Removing this information may affect Internet mail routing and delivery in these environments.

4.4.1.14 Upgrading the admin4.nsf database on an MTA server

If the upgraded mail server is also the administration server for the domain's Domino Directory, upgrade the design of its Administration Requests database (admin4.nsf) to the R5 template (admin4.ntf). If the upgraded server is not the administration server, you do not need to upgrade its template. After upgrading the template for the administration server, replicate the new design to all other Domino servers.

4.4.2 MTA upgrade scenario

The R4 MTA gateway is still supported for interoperability with R5. Features and functions that worked in Release 4 continue to work in Release 5. Changes to your existing configuration are not required. Domino uses all R4 addressing and routing without change. You will need to consider how this message format change affects your Internet mail architecture and whether any changes are necessary. However, the R4 MTA does not handle MIME format messages in a native way, which is now the standard in R5. Domino R4 servers used Message Transfer Agent (MTA), a proprietary mail gateway server, to route Internet mail. In Release 5, the Domino router routes Internet mail over SMTP. Mail clients can use Internet mail with MIME or Notes Mail in Notes format. Domino routes both formats natively and converts automatically between them without the need for a separate gateway. Before you upgrade to R5, you must determine how to manage this type of traffic in your environment.

Each organization should consider when to upgrade its R4 MTA servers to R5 mail servers. R5 has three major changes that affect this decision:

- The R5 router sends, routes, and delivers MIME messages over both SMTP and Notes RPC.
- The R5 database format stores MIME messages natively.

- Notes R5 Clients can create, read, and send MIME messages over both SMTP and Notes RPC.

When considering upgrading the R4 MTA gateway to R5, you have a number of options. These options are described in the following sections.

4.4.2.1 Continue to use the R4 MTA gateway

You may choose to continue running the R4 MTA gateway for some period of time as you upgrade to R5. However, this option does not allow your organization to use the new Internet mail features of the R5 server. A Domino R5 server can handle messages in both Notes proprietary format and MIME. If your architecture is configured to route Internet messages to a R4 MTA, the Domino R5 server will convert MIME format messages to Notes proprietary format, then the MTA will convert them to MIME again. This double conversion provides interoperability between R4 and R5, but also increases the load and presents some risk of data fidelity loss.

4.4.2.2 Restrict MIME format messages

In the new R5, you can control the generation of MIME messages on both the server and client. If you choose to restrict MIME format messages, you need to implement and manage the server and the client. This solution provides a way of controlling your Internet message traffic in the new R5. You can restrict the messages using Notes Client control or Domino server control methods:

Notes Client control	To prevent messages from being generated in MIME format in a Notes R5 Client, do the following: Tell users not to change their preferences and/or set them appropriately. However, this is not a reliable control. The Location document in the Personal Address Book contains an Advanced tab, which, in turn, includes a MIME Setting parameter. If you change the first parameter on the MIME Settings tab to Notes Rich Text Format (instead of using MIME), the Notes R5 Client will create messages in the Notes proprietary format.
Domino server control	At the Domino R5 server, you can prevent messages from being routed in and converted to or from MIME format. This control is more reliable. However, it could cause delivery failures for some MIME messages. The MailNonDeliverNativeMime parameter on the server notes.ini file controls this

behavior. If you set the parameter to **0**, the router will accept and convert MIME messages for delivery. If you set it to **1**, the mail router will return any MIME messages, unconverted, with a delivery failure.

4.4.2.3 Replace R4 MTA gateways with R5 first

The R5 mail servers perform the same tasks as R4 MTAs with greater performance, stability, and message fidelity. Your organization can use R5 features such as restrictions to prevent spamming and control maximum message size. Notes R5 and Internet clients can use native MIME seamlessly.

If you upgrade your R4 MTA servers to R5 before upgrading the rest of your Domino system, the R5 mail servers store MIME messages in MIME format, but must convert the messages to Notes format, an attachment containing the MIME message, or both, when transferring the message to an R4 server.

As you change your infrastructure to R5, the R5 mail servers can route MIME messages to other R5 mail servers, which can deliver the messages or perform the conversion for R4 servers.

4.4.2.4 Replace R4 MTA gateways with R5 during system upgrade

This strategy is similar to upgrading MTAs before upgrading the rest of your system, but allows you to select when to begin conversion on hub servers or spoke servers. This option is optimal in both messaging architecture and administration. It will simplify both your infrastructure and its management. However, you may also need to make other adjustments to accommodate this change, depending on your current Internet messaging architecture.

You could change your mail architecture to replace the R4 MTA with a Domino R5 server by routing a portion of your inbound and outbound Internet mail traffic. You could gradually increase the level of traffic over time and balance the message conversion and routing load appropriately for your Internet message levels and types.

4.4.2.5 Rework the messaging infrastructure

In an R4-style Internet messaging infrastructure, all Internet mail messages route through one or more dedicated MTA server. In R5, this is no longer necessary because all R5 servers can route Internet mail, including performing any necessary conversions. You can decide when to move from an R4 MTA gateway architecture to a more distributed Internet mail routing scheme.

When you enable a distributed infrastructure, where messages no longer route through a few SMTP servers, but rather use the R5 router to transfer Internet mail, consider the possible conversion load from Notes Clients. If a Notes Client sends a message to Internet recipients in Notes message format, the R5 mail server converts that message to MIME and routes it. If your mail servers are near maximum capacity, this conversion load may place an unacceptable strain on them. However, spreading conversion across all mail servers, instead of concentrating it on a few MTA servers, is often a performance improvement for organizations. Depending on your system, you may want to wait until you begin converting Notes Clients to R5 to rework your messaging architecture, since R5 clients can send and read MIME, the conversion load on their mail servers is less.

Even if you enable SMTP routing on all mail servers in your organization, they do not all need direct Internet access. You can use a relay host for mail routing beyond your local Internet domain and for security purposes. The relay host can be an R5 mail server, an R4 MTA, or a third-party product.

If you do enable direct Internet access for all mail servers, make sure they are correctly configured and properly registered with the InterNIC. Many systems do not accept connections or mail from servers that are improperly configured or not registered as a safeguard against spam and as a relay security measure.

4.4.2.6 Use a mixed MTA upgrade strategy

Some organizations will use a combined strategy, depending on their needs and infrastructure. For example, a multinational organization may immediately upgrade its MTA servers in one part of the world and wait until the Domino system is at R5 to upgrade in another. Use these scenarios and the needs of your organization to determine the optimal upgrade strategy.

4.4.3 How R5 replaces the R4 MTA gateway

When you enable an R5 server to send messages over SMTP outside the local Internet domain (configured in the Server Configuration document), the server no longer needs to use the Foreign SMTP Domain and SMTP Connection documents. The server can connect using TCP and route mail through SMTP. The server can use a relay host as needed and can make connections using DNS or using a hosts file. The server uses the router to route mail over SMTP and to perform conversion between Notes format messages and MIME format messages. Thus, the R5 server replaces the outbound services of the MTA.

When you enable an R5 server to listen for inbound SMTP connections (configured in the Server document), the server performs the same functions as the inbound MTA services. Inbound messages are stored in mail.box and transferred or delivered by the router. MIME messages are stored in that format and routed over either Notes RPC or SMTP to their destination. If needed, the router converts between MIME and Notes format messages.

4.4.4 Comparing R4 MTA configuration with R5 configuration

This section describes configuration information in the R4 MTA. It also describes where that information exists and where it is configured in the R5 Internet mail server.

4.4.4.1 R4 Server document

This topic describes configuration information in the R4 MTA Server document (Public Address Book). It also describes where that information exists and where it is configured in the R5 Internet mail server.

Table 10. R4 Server document (Public Address Book)

Item	Location on Domino R5
General section - Fully qualified Internet host name	Server document.
General - Global domain name	All R5 servers use all R5 Global Domain documents and do not need to find only one document.
SMTP Mail Routing task, in Routing Tasks field	Server Configuration document: SMTP used when sending messages outside of the local Internet domain. You must continue to list SMTP Mail Routing in the Routing Tasks field in the Server document if R4 and non-SMTP R5 servers route Internet mail to this server.
Control - Enable daily housekeeping	Not used.
Control - Perform daily housekeeping at	Not used.
Control - Poll for new messages every X minutes	Not used.
Control - MTA work path	Not used.
Control - Log level	In server log file (LOG.NSF), SMTP outbound logging is router logging; SMTP inbound logging is SMTP task logging; logging is controlled by notes.ini variables.

Item	Location on Domino R5
Conversion - Header handling	Not used.
Conversion - Attaching encoding method	Server Configuration document => MIME => Conversion Options => Outbound tab.
Conversion - Message content	Server Configuration document => MIME => Conversion Options => Outbound tab.
Conversion - Support return receipts	Server Configuration document => MIME => Conversion Options => General tab => Return receipts.
Conversion - Language parameters	Server Configuration document => MIME => Basic tab and MIME => Settings by Character Set groups.
Conversion - Use character set detection routines	Server Configuration doc => MIME => Conversion Options => Inbound tab => Use character set auto-detection if message has no character set information.
Conversion - Message Typeface	Server Configuration doc => Conversion Options => MIME => Settings by Character Set groups.
Conversion - Message Point Size	Server Configuration doc => Conversion Options => MIME => Settings by Character Set groups.
Conversion - Outbound Macintosh message conversion	Server Configuration doc => Conversion Options => MIME => Advanced => Advanced Outbound Message Options tab => Macintosh attachment conversion.
Outbound Configuration - Number of processes	Not used.
Outbound Configuration - Maximum outbound message size	Server Configuration doc => Router/SMTP => Restrictions and Controls => Restrictions tab => Maximum message size.
Inbound Configuration - Number of processes	Not used.
Transport Configuration - Transfer mode	Not used.
Transport Configuration - Host name mapping	Server Configuration doc => Router/SMTP => Basic tab => Maximum message size.

Item	Location on Domino R5
Transport Configuration - Retry limit	Not used.
Transport Configuration - Retry interval	Not used.

4.4.4.2 R4 Foreign SMTP Domain document

This topic describes configuration information in the R4 MTA Foreign SMTP document (Public Address Book). It also describes where that information exists and where it is configured in the R5 Internet mail server.

Table 11. R4 Foreign SMTP document (Public Address Book)

Item	Location on Domino R5
Allow mail only from domains	Server Configuration document => Restrictions and Controls => Restrictions tab => Allow mail only from Notes domains.
Deny mail from domains	Server Configuration document => Restrictions and Controls => Restrictions => Deny mail from Notes domains.
Messages addressed to [Internet domain] should be routed to [Domain name] or [Internet host]	Used in R5 to route Internet mail to Domino SMTP servers, unless all mail servers can route outbound SMTP Internet mail. If your organization only uses a few MTA servers, continue to use Foreign SMTP Domain and SMTP Connection documents to route outbound Internet mail to the SMTP servers.

4.4.4.3 R4 Global Domain document

This topic describes configuration information in the R4 MTA Global Domain document (Public Address Book). It also describes where that information exists and where it is configured in the R5 Internet mail server.

Table 12. R4 Global Domain document (Public Address Book)

Item	Location on Domino R5
Global Domain document	All existing documents are carried forward.
Primary Internet domain (set in first Global Domain document in R4)	Global Domain document => Conversions => SMTP Address Conversion => Local primary Internet domain. (R5 pulls primary domain from first Global Domain document.)

Item	Location on Domino R5
Alternate Internet domain aliases (set in all other Global Domain documents in R4)	Global Domain document => Conversions => SMTP Address Conversion => Alternate Internet domain aliases. (R5 pulls aliases from all Global Domain documents except first one.)
Internet address lookup	Server Configuration document => Router/SMTP => Basics tab => Address lookup. If enabled, R5 looks for the Internet address in the Domino Directory; if disabled, Domino converts the Internet address.

4.4.4.4 R4 notes.ini parameters

This topic describes configuration information in the R4 MTA notes.ini parameters (server notes.ini file). It also describes where that information exists and where it is configured in the R5 Internet mail server.

Table 13. R4 notes.ini parameters (server notes.ini file)

Item	Location on Domino R5
SMTPMTA_CONVERT_ORIGINALOR (looks up originator's address in Public Address Book)	Not used.
SMTP_KEEP1MEANS1=X (force MTA to treat local domain in same way as other domains)	Not used.
SMTPMTA_IPPORT (port that SMTP listens on)	Server document => Ports => Internet Ports => Mail => Mail (SMTP Inbound) and Mail (SMTP Outbound) => TCP/IP port number => set to port 25 on upgrade.
SMTPMTA_DENIED_DOMAINS=file name, where filename is an ASCII file with list of denied domains (deny mail from Internet domains)	Server Configuration documents => Restrictions and Controls => SMTP Inbound Controls and SMTP Outbound Controls sections.
SMTPMTA_TRACE_LEVEL=0x0000 0100 (enhanced tracing in log)	Not used.
SMTPMTA_NO_INLINE_CONTENT_DISP=1 (disable RFC 1806 support to disable content disposition headers if disposition type is inline)	Not used.

4.4.4.5 R4 SMTP Connection document

This topic describes configuration information in the R4 MTA SMTP Connection document. It also describes where that information exists and where it is configured in the R5 Internet mail server.

Table 14. R4 SMTP Connection document

Item	Location on Domino R5
Relay host	Configuration document, Router/SMTP => Basics tab, Relay host for messages leaving the local Internet domain. You must also enable the field SMTP used when sending messages outside of the local Internet domain for the relay host to function properly.

4.4.5 Multiple mail.box databases

One new feature is the ability to have multiple mail.box databases, which reduces contention for heavily used mail servers. If you have only one database called mail.box, where all mail is deposited, this can become a bottleneck, especially if you are running a lot of users or if you want to compact the database. With multiple mail.box databases, you can spread the load and the contention over as many as you wish (this is a way to improve scalability and performance). You can also take the mail.box databases offline individually.

R5 can route mail using multiple mail.box databases. Under heavy load, several server threads may try to deposit mail into mail.box, along with the router attempting to read and update mail. Any process trying to write to mail.box, including the server threads and the router, needs exclusive access to mail.box. In addition, when the router reads new messages from mail.box, other processes trying to write to the database must wait. This can lead to long wait times if there is a large amount of new mail, for example, on a busy system with heavy mail traffic.

With multiple mail.box databases, Domino can use multiple concurrent processes, since one process can write to each mail.box database. When the router is reading one mail.box, it marks the database *in use*, so other server threads trying to deposit mail move to the next mail.box. This improves performance.

Disk contention is rarely an issue for mail.box, so there is usually no need to put the multiple mail.box databases on different disks. However, it is useful to spread user mail files across multiple disks to ensure that all mail files and mail.box databases are not on the same disk.

You will see large performance improvements by adding even one additional mail.box database. Marginal benefit decreases with the increasing number of mail.box databases, although you will continue to see performance gains.

4.4.6 Internet mail addresses in R5

R4 Internet addressing is unchanged by default when you upgrade to R5; the Internet Address field is optional. However, if you choose, you can use the Domino R5 Internet Address tool to automatically assign Internet addresses to your users. This tool fills in the Internet Address field for Person documents in the Domino R5 directory. When looking up an address for Internet mail in the Domino Directory in R5, Domino checks the (\$Users) view for an exclusive match of the address. If it finds the complete Internet address of the recipient in either the Short name or Internet Address field, Domino delivers the message to the mail file of that person. Domino also delivers based on a match of the local part of the address with any of the fields in the Person document.

Note

The exhaustive lookup of Domino in (\$Users) ensures that any address generated by the R4 MTA for a user in your directory is located properly. Domino does not distinguish between R4 and R5 addressing and utilizes both equally well.

4.4.7 Internet mail storage format in R5

You do not need to change how users' Internet messages are stored when upgrading to R5. If you have users who only access mail using a IMAP or POP3 client like Netscape, and whose Person documents set their Internet message storage to both Notes and Internet in Release 4, change the Format preference for incoming mail field on the Mail tab of those users' Person documents in the Domino Directory to **Prefers MIME** for improved performance. See Figure 33 on page 127.

PERSON: User03 R50/ITSO User03 R50/ITSO @ Austin

Basics | Mail | Work/Home | Other | Miscellaneous | Certificates | Administration

Mail

Mail system:	Notes
Domain:	Austin
Mail server:	USAUSLN03/ITSO
Mail file:	mail\R50User03
Forwarding address:	
Internet address:	User03R50@itso.austin.ibm.com
Format preference for incoming mail:	Prefers MIME
Encrypt incoming mail:	No

Figure 33. Domino: Changing the format preference for incoming mail

Note

In a mixed R4/R5 environment in the same domain where some clients use native MIME messages on R5 servers, Domino will not deliver a native MIME message to an R4 client, mail file, or server, because native MIME is unreadable in Release 4.

4.4.8 Upgrading R4 MTA and notes.ini parameters

When you upgrade an R4 MTA server to R5, the notes.ini file for the server may contain parameters that are not supported in R5. You do not need to change or remove these parameters, they are ignored by the server and do not interfere with its functionality in any way.

The upgrade program sets configuration parameters to the settings most commonly used for Internet mail servers. It does not convert R4 notes.ini settings to their R5 equivalents.

Note

If you have unique configuration settings in the notes.ini file in R4, you may need to re-enable this configuration using the R5 Server Configuration and Server documents.

4.4.9 IMAP and POP conversion changes in R5

Conversion from Notes format to MIME in R5 is improved for IMAP and POP users. The IMAP or POP conversion in R5 is similar to the conversion process of the R4 SMTP/MIME MTA and offers greater message fidelity than the R4 IMAP or POP conversion process. The R5 conversion process has more complete text and image handling than R4, but is somewhat slower.

4.4.10 Relay host changes in R5

In Release 5, relay host configuration is easier than in Release 4. You can select to route all mail with destinations outside the local Internet domain to a relay host, or not to use a relay host at all. There is no need to route mail inside the local Internet domain to a relay host since Domino routes SMTP natively.

After upgrading to R5, you need to enter the host name or IP address of the relay host in the Server Configuration document for the upgraded server. In addition, you must set the SMTP used when sending messages outside of the local Internet domain field to **Enabled**.

4.4.11 Upgrading an Internet mail server to use multiple threads

After upgrading to R5, a mail server router automatically supports multiple transfer threads to the same server. By default, the router allows multiple threads based on configuration settings. You can change these settings to allow more or fewer multiple transfer threads. You can change the maximum number of transfer threads and the maximum number of concurrent transfer threads in the Server Configuration document in Domino Directory. Click the **Restrictions and Controls => Transfer Controls** tabs and adjust the settings to optimize performance in your system. See Figure 34 on page 129.

CONFIGURATION SETTINGS: OS2DominoR5/ITSO

Basics | Router/SMTP | MIME | NOTES.INI Settings | Administration

Basics | Restrictions and Controls | Message Tracking | Advanced

Restrictions | SMTP Inbound Controls | SMTP Outbound Controls | Delivery Controls | Transfer Controls

Transfer Controls

Maximum transfer threads:	1
Maximum concurrent transfer threads:	1
Maximum hop count:	25
Low priority mail routing time range:	12:00 AM - 06:00 AM
Initial transfer retry interval:	15 minutes
Expired message purge interval:	15 minutes

Figure 34. Domino: Changing an upgraded mail server to use multiple threads

4.5 Upgrading databases and applications

Upgrading your current applications will be a relatively small part of your upgrade. Existing R4 applications will run without modification on an R5 server and with the new R5 On Disk Structure (ODS). Be sure to consult the Release Notes (readme.nsf) to find any known incompatibility issues. R4.x uses ODS Version 20 (ODS20), while R5 uses Version 41 (ODS41). The ODS is one of the biggest improvements in R5. It provides new database structure, better performance and data integrity, as well as new database properties that were not available for R4-format databases. You can take advantage of these features only when the database exists in an R5 format.

Note

When upgrading your applications to R5, it is essential to move to the R5 file structure.

Operations performed by R5 databases require considerably less I/O than R4 databases. With the new R5 ODS, when we do write to disk, we write in a smaller number of places on the disk and do much more sequential writing. What we get out of this is approximately half the I/O rate as in R4 databases.

for the same set of operations. In addition, with the new ODS, you gain *online* and *in-place compaction*. This means that when you compact a database, the compaction occurs in-place, meaning that your server does not require extra disk space. Also, users can continue to work in the database during compaction.

Performance improvements include:

- Better use of memory and I/O
- Better mail server performance and availability
- Faster name resolution
- Faster view updates and rebuilds

Test your applications on an R5 server before deploying them in a production environment. Test/upgrade first and leverage new functionality later:

- Before you begin, test the applications to ensure they run as expected before the upgrade.
- Decide when to begin developing in R5, either in parallel with server upgrades or later in the upgrade schedule.
- After the completion of client upgrades, start deploying production applications that will immediately function properly and take advantage of new R5 features.

Note

When you upgrade to use R5 templates and features, be aware that R4 clients cannot use these features.

Upgrading your applications' storage format may be as easy as running compact (whether initiated by a client or the server) on the database to change the database structure. Some R4 databases, however, may need reprogramming to take full advantage of R5 or to function properly.

There are three possibilities for upgrading databases and applications in the R5 environment:

1. Upgrade an application server to R5, but leave databases in R4 format (ODS20) using R4 design and features.

All clients can access this database without issues, and there should be no problems with the upgrade.

2. Upgrade the server and database format to R5, but leave the database design and features at R4.

All clients can access the database without issue, but R4 clients cannot make local replicas of the database without specifying that it should be an .NS4 replica. There should be no problems with the upgrade. Compact the database to the new ODS.

3. Upgrade the server, database format, database design, and database features to R5.

R4 clients cannot use R5 features and cannot make a local replica of the database without specifying that it should be an .NS4 replica. You may need to make changes to the application to use new features. Compact the database to the new ODS (ODS41), replace the R4 design with the R5 design, and add new R5 features as wanted.

The following sections describe how to upgrade existing Domino databases and applications to use new features provided by R5.

4.5.1 Upgrading the database format

After upgrading a server to Domino R5, you can upgrade the databases on that server to R5 database format (On Disk Structure, or ODS) and design (template). The two steps, upgrading database format and upgrading database design, are independent of each other. Since ODS does not replicate, you can leave the design of a database based on an R4 template and upgrade the database format on that server to R5 ODS.

Note

If you decide to upgrade the database design to use R5 templates and features, be aware that R4 clients cannot use the new R5 features. Some R5 features and templates require that a database use R5 database format.

Before upgrading the database format to R5:

- Upgrade the application server to Domino R5 (necessary to allow the server to host R5 databases and use R5-style compaction).
- Run Fixup on databases. This prevents most errors that interfere with compaction to the new database format.

After upgrading the database format to R5:

- Consider running `IUPDALL -R` on the database. This rebuilds views in the database, preventing delays when users first try to access it. This is especially important for databases that are used frequently, are mission-critical, or have large views.

Note

In R5.0, users may experience an initial delay when accessing upgraded databases for the first time. This occurs because all database views rebuild on initial access due to the updated View version in this release. To prevent this, run `IUPDALL -R` on the database to rebuild the views.

Once you install Domino R5 on a server, you can upgrade the format of databases on that server. Compacting a database using Domino R5 upgrades the database format (On Disk Structure, or ODS) to Release 5. You can use the `-R` option with the `COMPACT` command to keep a database in R4 format or to roll its format back to R4 ODS. To prevent Domino R5 from upgrading the format of a database to R5, rename its extension `.NS4`.

4.5.1.1 Compact a database to R5 using Domino console

To compact a database to R5 format, do the following:

1. Upgrade the application server to Domino R5.
2. Launch the upgraded server. On the Domino server console, type:

```
load compact DBFileName.nsf
```

Press **Enter**. `DBFileName.nsf` is the file name of the database you wish to compact to R5 format.

4.5.1.2 Compact a database to R5

You can also compact databases from a Notes Client. If a user compacts a database using a Notes Client, the server compacts the database for the client. Thus, a Release 5 Domino server compacts the database using R5 compaction and an R4 Domino server compacts the database using R4 compaction. It is possible for Notes users to compact an R4 database on an R5 server to the new R5 database format (ODS).

1. From the Windows Notes R5 Administration client, open or highlight the database that you want to compact.
2. Select **File => Database => Properties**.
3. Click the **i** (information) tab shown in Figure 35 on page 133. You will see the ODS version property for that database near the bottom of the dialog box, as shown in Figure 35.

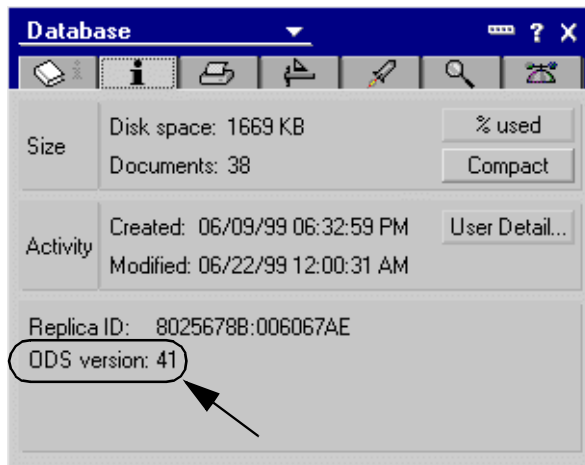


Figure 35. Domino: Displaying ODS version

4. Click on the **Compact** button.
5. The message `Finished compacted` will appear.
6. Close the window.

4.5.2 Upgrading the mail files of users

When you upgrade users' mail files to the R5 template, you can do so one file at a time, or use the mail conversion utility to automate upgrading the design. Be sure that you have already upgraded the Domino server hosting the mail files and the Notes Clients accessing them to Release 5, or users will not be able to use R5 features in the new design. Upgrade mail files at a time when users will not be accessing them. Notify users that their mail files will be unavailable while they are being upgraded.

Important

Only convert those mail boxes for users that will be migrating to either the WebMail browser client or the Windows Notes R5 Client.

To upgrade the mail files of users, do the following:

1. If users have customized their mail files, instruct them to back up these customizations. This allows users to reapply changes they made to their R4 mail file to the new R5 mail template. In many cases, these changes are unnecessary because R5 features perform the same function as the

modifications. Have users try the new R5 mail template without changing it to determine what changes, if any, they need or want to make.

2. Launch the Domino server on which you want to customize mail files.
3. Shut down the router. At Domino server console, type:

```
>tell router quit
```

Press **Enter**. This prevents Domino from routing mail to the mail files while they are being upgraded. Mail is stored in mail.box while you upgrade the mail files. Once you have upgraded the mail files and loaded the router task again, the router processes and delivers the mail in mail.box.

4. Load the mail conversion utility. At Domino server console, type:

```
>load convert [arguments]
```

Press **Enter**.

The mail conversion utility command uses arguments to specify options. It has the form:

```
load convert [-r | -l | -f | -m] mailfilepath  
existingtemplatename newtemplatefilename
```

Where **-r** converts mail files in subdirectories of the specified directory, **-l** creates a text list of mail files, **-f** uses a text list of mail databases to determine which mail files to upgrade, **-m** converts the file or files for IMAP use, **mailfilepath** specifies which mail file or files to upgrade, **existingtemplatename** specifies a certain mail file design to upgrade, and **newtemplatefilename** specifies the template with which to upgrade the mail files.

For example, to upgrade a single mail database **umail01.nsf** in the **\mail** subdirectory of the Notes data directory, type at Domino server console:

```
load convert mail\umail01.nsf * mail50.ntf
```

Press **Enter**.

The mail conversion utility replaces the current mail template (regardless of which template the mail file uses) with **mail50.ntf**, the R5 mail template.

5. Once you have finished upgrading mail files to the R5 template on this server, load the router. At Domino server console, type:

```
>load router
```

Press **Enter**.

6. Notify users that you upgraded their mail files to the R5 design.

4.5.3 Upgrading the database design

R5 does not automatically upgrade databases to the R5 design. For example, when the design task runs, it does not upgrade mail files from the R4 mail template to the R5 mail template. This allows you to choose when to upgrade database design. For information on upgrading mail database designs, see 4.5.2, “Upgrading the mail files of users” on page 133.

You should prepare for the possibility that minor interoperability exceptions may arise due to the nature of application development. An application developer may have used a feature in a way that worked under R4, but no longer works the same way in R5. Typically, a small design change quickly addressed these cases. Any work arounds are well-documented in the Release Notes (readme.nsf) that come with R5, so be sure to review those before proceeding.

There are some conditions that might require application modification in specialized circumstances:

External database lookups from layout regions

In R4, it was possible to perform a field lookup within the layout region to another database by storing the replica ID of the second database in the main form and simply referring to it in the layout region. However, Notes/Domino R5 supports layout regions as self-contained design elements (such as a field or subform), rather than as virtual extensions of the main form. If your application incorporates this lookup approach, the lookup will not work. The supported method is to include the replica ID of the lookup database in the layout region.

Hierarchical user names in mail-enabled work flows

If your organization enables the new Directory Catalog feature, it may increase the number of possible matches when Notes/Domino tries to resolve a user name that you type in a field. Using only the common name version of user names in your work flows increases the frequency of users being presented with a dialog box to select the correct person. While this behavior does not stop or prevent the work flow, users can find it annoying. A more effective method is to use the full hierarchical name when programming work flow into your application.

Full-screen navigators

In R5, the browser-style user interface displays information differently, affecting both position and scale on

the screen. Applications with navigators and other graphical elements may experience cosmetic display problems, which can generally be addressed by making minor size and layout adjustments. Full-screen navigators are more likely to be affected.

Past releases offered programmers a few functions (@V2if and @V3Username, for example) specifically to ensure interoperability with prior releases. In support of the seamless interoperability design goal, Notes/Domino R5 continues to support functions that were documented in prior releases. Any older applications that contain these release-specific functions should work under R5 as they do under R4. Although you may choose to replace these functions at some point for ease of maintenance, you do not need to remove them in order to upgrade to R5.

You will immediately notice some changes when you first access an application with R5. They won't cause application errors, so you won't need to do anything immediately. However, make sure that your application upgrade strategy considers how to address these differences:

- The menu bar is different.
- Agents and formulas will work without modification, but remember to change any references in help and/or user documentation.
- The screen layout and navigation is different, which may affect process instructions and user training.
- Additional @Functions for new R5 features.

4.5.3.1 Upgrading Web applications

Elements with unsupported formulas that Domino hid automatically in Release 4.5 may now display if you select the Use JavaScript property. With the property selected, Domino does not check any hotspot or button formulas before using JavaScript to generate the page. Web users see all buttons, actions, and hotspots (even those that contain @commands and @functions that are not supported for Web applications).

Revise any formulas that relied on hotspot formulas being evaluated at display time. Make sure these formulas evaluate correctly after the user clicks the hotspot, not before. Replace Release 4.5 attachment fields with Web Element - File Upload Controls if you set the Use JavaScript property. The Use JavaScript setting disables @Command([EditInsertFileAttachment]) hotspots used to create attachment fields in Release 4.5, because the hotspot is not evaluated when the page is displayed.

The Use JavaScript property can cause unexpected results because the URL generation in Release 5.0 is different from what it was in Release 4.5. Check any formulas that rely on accessing a Query_String or Path_Info URL fragment. The URLs will frequently be different. For example, POST URLs that included ?CreateDocument and ?SaveDocument are no longer generated in Release 5. The new POST URL is a variation of ?OpenForm or ?EditDocument.

Using default Web templates with older browsers

The default Web templates that ship with Release 5 are not supported on browsers that do not conform to the JavaScript 1.1 standard. If a browser that does not conform to JavaScript 1.1 attempts to access one of the default Release 5 Web templates, the template displays an error message. Release 5 includes special Web templates designed to work with noncompliant browsers.

Applications designed for Web usage operate as expected when accessed with browsers that do not comply with the JavaScript 1.1 standard as long as the application does not use JavaScript features not supported by these browsers. This is a limitation with the browsers and not with the templates or applications. Domino and Domino applications support all browsers, but some of the tools that you can use with Domino (for example, JavaScript) are not supported by all browsers.

The Release 5 Web templates work with JavaScript 1.1-compliant browsers, including the following (please also refer to Chapter 6, "Using the browser (WebMail) client" on page 197):

- Netscape Communicator 4.x
- Netscape Navigator 3.x

If you are designing applications to be accessed by browsers that are not compliant with the JavaScript 1.1 standard and want to use the Release 5 Web templates, be sure to use the special Web templates designed for noncompliant browsers.

4.5.4 Upgrading document libraries

When you replace a R4.x document library design with either the R4.6 or R5.0 template (Doc Library - Notes and Web), run the Upgrade Doclib R4 Documents to New Design agent in the database before opening any of the converted documents. To upgrade document libraries, do the following:

1. From the Windows Notes R5 Administration client, open or highlight the upgraded database.

2. Choose **Actions => Upgrade Doclib R4 Documents to New Design.**

Note

If you do not run this agent, you receive an error message when you attempt to open a document and views do not correctly display document status.

4.5.5 Preventing template replication between R5 and R4 servers

If you have a mail file on an R5 server with an R5 template and a replica of that file on an R4 server with an R4 template, you must ensure that the designs of the mail files do not replicate. A mail file with an R5 design on an R4 server does not work properly, and you want to ensure that the older R4 design does not overwrite the R5 design on the R5 server.

Note

Do not put an R5 mail template on an R4 server. The R5 template contains features that require an R5 server to work properly.

To prevent the mail templates of the two replicas from replicating, do the following for each mail file:

1. From the Windows Notes R5 Administration client, open the replica mail database.
2. Choose **File => Replication => Settings.**
3. Click the **Advanced** tab.
4. Under Replicate incoming, deselect **Forms, views, etc.** and **Agents** as shown in Figure 36 on page 139.

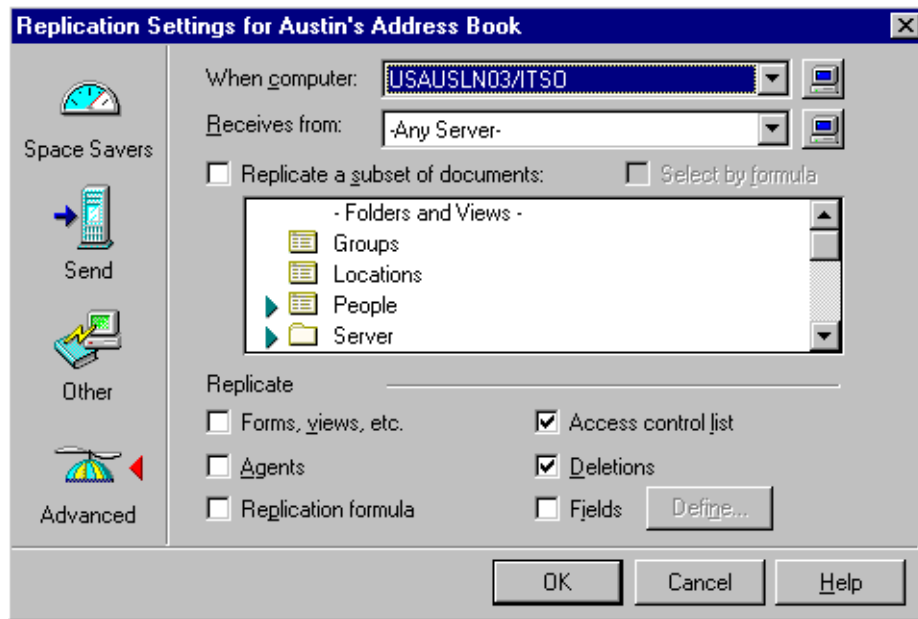


Figure 36. Domino: Preventing template replication

5. Click **OK**.

Make sure you do this for each replica.

Note

Replication can be disabled in the cldbdir.nsf database within clustered servers.

4.5.6 Keeping a database in R4 format

Any Notes Client can access a database hosted on a Domino server, regardless of the release the client or server is running or the release format the database uses. However, Notes Clients cannot access or use database features from later releases; for example, a R4 Notes Client can access a R5 database on a Domino server, but it cannot access or use R5 features in that database.

If a database is stored on the local drive of a client, only clients of the same release and later can access it. For example, a database in R4 format can be accessed locally by a R4 or R5 Notes Client.

Domino servers can only host applications in their release format and earlier formats. For example, an R4 server can host an R4 or R3 database, but not an R5 database.

To create an R5 application that can be accessed locally by R4 clients and stored on R4 servers, give it the extension .NS4 in the File Name field when creating the database. To keep a database in Release 4 format so it can be accessed locally by R4 clients or stored on an R4 server, change the database's extension to .NS4 using the OS/2 command line before compacting to R5 ODS, or make a new replica of the database using the extension .NS4.

Note

If a R5 client compacts a local replica of a R4 database, the database moves to R5 database format and cannot be accessed locally by R4 clients.

To create a replica of a database in Release 4 format, do the following:

1. From the Windows Notes R5 Administration client, choose **File => Database => Open**.
2. Select the database for which you want an R4 replica.
3. Click **Open**.
4. Choose **File => Replication => New Replica**.
5. In the File Name field, give the new replica the extension .NS4.
6. Click **OK**.

4.5.7 Rolling back R5 applications to R4 format

In order to support new features and improved scalability and performance, the R5 database file format is different than in R4. However, this difference should have minimal impact on daily operations. The two formats are compatible within the Notes/Domino environment for both R5 and R4 clients and servers, except that R4 users cannot see or utilize new R5 features.

Databases will be converted to or created with the R5 file format under the following circumstances:

- Existing databases are automatically updated to R5 format by the COMPACT (whether initiated by a client or the server) or IUPDALL utilities.

- New databases are created in R5 format when you create a new database on a client or server that is running R5 (either by using an R5 template or by copying or replicating an existing database).

Under special circumstances, you may need to roll back individual databases or an entire server to an R4 environment. You can roll back to an earlier ODS version by using `COMPACT -R` or by creating a new replica or copy of the database in R4 format. Notes Clients from R4 can access R5 databases on R5 servers, but you cannot use a R5 database on a Domino server running an earlier version of the software.

The R5 database format does not replicate, and R4 servers ignore unsupported R5 features, so you can safely replicate a database replica that has been upgraded to R5 database format with a replica that has not.

4.5.7.1 Using compact to roll back to R4 format

To roll back an R5 application to R4 format by using compact, do the following:

1. Change to the Domino server console and type:

```
>load compact DBFileName.nsf -R
```

Press **Enter**. `DBFileName.nsf` is the file name of the database you want to roll back to R4 format.

Domino will compact the database and convert it back to R4 ODS format.

4.5.7.2 Rolling back to R4 format by creating a new replica

To roll back an R5 application to R4 format by creating a new replica, do the following:

1. From the Windows Notes R5 Administration client, choose **File => Database => Open**.
2. Type the name of the server that hosts the database you want to roll back in the Server field and click **Open**.
3. Navigate to and select the database you want to roll back and click **Open**.
4. Choose **File => Replication => New Replica**.
5. In the File name field, change the database extension from `.NSF` to `.NS4`.
6. Click **OK**.

Note

Rolling back by creating a new replica will impact any lookup functions that explicitly reference the database by file name (rather than by replica ID).

The new replica will be in R4 format and can be placed on any server running R4 or later and accessed locally by any R4 or later client.

4.5.8 Upgrading applications and R5 requirements

When you upgrade an application server and its applications to R5 and decide to use features such as transaction logging, be sure to do the following:

- Specify a drive with sufficient disk space for view rebuilds by setting the View_Rebuild_Dir variable in the notes.ini file to that drive. By default, this variable is set to the temp directory on the system. This drive holds the temporary files used to rebuild views; a larger disk allows faster rebuilds and greater optimization. View rebuilds can be as much as five times faster in R5 than R4. The size of the drive needed for view rebuilds depends on the size of the views you are rebuilding.
- Use a separate, single-purpose disk to hold the log files for transaction logging. The default location for these files is the LOGDIR directory in the server's data directory. A separate disk allows faster writes to the log. The log requires at least 200 MB disk space and can be set as large as 4 GB; Lotus recommends a separate disk of at least 1 GB. Using a dedicated mirrored drive is even better than a single disk for data recovery if the log disk fails.
- Use a third-party backup utility that supports Release 5 and transaction logging to provide maximum data recovery in case of errors or data corruption. With the backup utility, you can perform daily incremental backups and archives of the transaction log.

4.5.9 Benefiting from the new features of R5

Domino R5 has built-in connections for live access to relational databases, transaction systems, and ERP applications providing integration with enterprise systems. Domino Enterprise Connection Services (DECS) provides rapid connectivity to enterprise data. CORBA/IIOP support lets you integrate Domino with your applications architecture. DECS supports a wide range of enterprise systems, including DB2, Oracle, Sybase, ODBC, EDA/SQL, SAP, PeopleSoft, JD Edwards, Oracle Applications, MQSeries, CICS, and more. (Connectors for relational databases are included with

Domino; connectors for ERP applications and transaction processing monitors are sold separately.) With the integrated CORBA/IIOP support, you can access or update enterprise data from your Web applications in real-time through persistent, parallel, pooled connections. Serve Notes Clients and Web browsers with the same applications.

R5 lets you move beyond static Web sites and create high-value business solutions that include work flow, content management, and highly flexible security. With the Integrated X.509 support, R5 lets you register new users with Notes and/or X.509 certificates. S/MIME support ensures message integrity for all client types, SSL V3 for IIOP and LDAP clients. Authentication using trusted third-party directories reduces complexity and duplication of information.

Domino R5 delivers unmatched reliability and manageability. The transaction logging technology used by Domino databases is an industry standard for reliable data storage. It ensures complete data integrity for updates and facilitates incremental database backup and fast restart after system failures. The Remote Server Management option improves convenience for administrators and provides consistent IT support for field offices with remote server management using the Domino Administrator, optimized administrative tools, Web-based administration, batch console commands, and more. You could centralize the control of Notes desktops. Organizations that use the Notes R5 Client for mail and applications can centrally configure desktop settings, such as home server and UI preferences. Domino R5 also delivers powerful administration and the unmatched Internet messaging functionality found in the Domino Mail Server such as e-mail, calendaring and group scheduling, bulletin board, and newsgroups.

R5 has a integrated development environment, Domino Designer R5, with open standard support, such as Java, JavaScript, HTML4, and CORBA/IIOP. It is optimized to work with Domino and features a complete set of visual tools, such as WYSWYG HTML authoring, for rapid development and deployment of secure, e-business solutions. You can create or modify Domino applications using your choice of programming and scripting languages, including Java, JavaScript, and LotusScript, all in one environment. You can connect to enterprise data non-programmatically through the easy-to-use DECS interface, or programmatically from Java or LotusScript.

Chapter 5. Optimizing your Domino environment

This chapter provides a variety of information that may be useful to network administrators and Domino system administrators. Performance-related issues are also addressed. This document is divided into a server part and a client part.

The goal of this chapter is to help Domino administrators understand how to achieve the highest performance from Domino servers and Notes browser clients on the OS/2 platform. We focus on factors that directly impact server performance and how to modify these core settings.

From a user's point of view, in most cases, the main issues are response times and system availability. There is no strict rule for acceptable response time, but quite often users find response times under five seconds favorable. The easiest way to reach this goal is to keep the number of users per server low enough to keep above response time. This solution, even though it is the easiest way to go, leads to a higher number of servers and a low ratio between clients and servers. A high number of servers by itself is not a bad thing, but it can make administration harder and increase both direct cost (purchasing) and indirect costs (administration and maintenance) in the long run.

For these reasons, it often pays off to spend some time and resources on performance planning and come up with a better utilized, better optimized, and better performing Domino environment. In general, money spent on planning is often money well spent.

Unfortunately, there is no tuning tool that would adjust system settings to achieve maximum performance. Instead, performance tuning involves tuning several subcomponents, such as operating system settings, hardware optimization, Domino network, and server design. Successful server tuning requires knowledge of all these areas. Tuning only the Domino server may not lead to a great performance gain if the server's physical memory is the bottleneck.

Another key to performance tuning is to know that it is an ongoing process. Quite often, as the number of clients increases, the users get to know Notes and Domino better, and they start using new features. This results in more workload on the server. Monitoring the server hardware utilization and possibly collecting Notes statistics for usage information on the Domino server add an additional workload to the server.

5.1 Roadmap for server tuning

The following roadmap shows where to find the server tuning topics discussed in this book:

- **Server system tuning**
 - Operating system fine-tuning
Discussed in 5.2, “Optimizing the server operating system environment” on page 148
 - File system
2.2.3, “File system considerations for Domino R5” on page 33
 - Fault tolerance
2.2.5, “Deciding on fault tolerance” on page 49
 - CPU considerations
2.1.2, “CPU considerations” on page 26
- **Optimizing the server memory usage**
 - I/O tuning considerations
Discussed in 5.3.1, “I/O tuning considerations” on page 154
 - High Memory support
5.3.2, “High Memory support” on page 154
 - Unified Buffer Management
5.3.3, “Unified Buffer Management” on page 156
 - NSF_Buffer_Pool_Size
5.3.4, “The NSF_Buffer_Pool_Size parameter” on page 157
 - On Disk Structure (ODS)
5.3.5, “On Disk Structure 41” on page 158
 - Transactional logging
5.3.6, “Transactional logging” on page 160
 - File system cache
5.3.7, “File system cache consideration” on page 164
- **Domino server tuning**
 - Server tasks optimization
Discussed in 5.4.2, “Server tasks optimization” on page 166
 - Mail routing tuning
5.4.3, “Mail routing tuning” on page 166
 - Replication tuning
5.4.4, “Replication tuning” on page 167

- Limiting user access
5.4.5, “Limiting user access to the server” on page 168
- Changing logging options
5.4.6, “Logging options” on page 170
- Application tuning considerations
5.4.7, “Application tuning considerations” on page 172
- **Network tuning**
 - Network protocol selection
Discussed in 2.2.6, “Domino network design tuning considerations” on page 53
 - Domino server role in the domain
2.2.6.3, “Domino server roles” on page 55 and 5.4.1, “Server roles” on page 165
 - Replication topology
2.2.6.4, “Replication topology” on page 57
 - Domino clustering considerations
2.2.6.5, “Domino clustering” on page 57

5.1.1 Performance facts about Domino R5

In an all-browser clients scenario, without Domino Runtime Services (DRS), the server on which Domino R5 is to run plays a key role in performance. The more file I/O cache, the faster the processor, and the more processors the server has, the better the speed of downloading applets. In addition, performance really depends on the speed of your connection to the server. Performance usually is slower over a dial-up (modem) connection.

Connection speed

Connection speed plays a major role in client/server performance.

The number of Notes Web browser clients a server can handle may be up to eight times less than the same server with Notes *Fat* clients attached. The same server with Notes Web browser clients with DRS attached will be able to support about half the number of clients when compared with Notes *Fat* clients.

Limited number of HTTP clients

The number of HTTP clients (Notes Web browser clients) supported on one Domino R5 server is much lower than the number of *native* Notes users on Fat clients.

This is because the system without DRS does virtually no processing at the Notes Web browser client, accounting for the increased server load. Also, browser clients increase network load. (DRS, which is a Notes engine in disguise, will be made available later this year and next year on several platforms.)

Inactivate unnecessary ports

Only activate communications ports that you actually want to use. For example, if Domino is set to use LAN0, although there is no LAN0 interface configured on your server operating system, it will slow down Domino's server performance. In an all-browser clients scenario, TCP/IP should be the only port activated.

Although the OS/2 Domino server comes with its own Java engine, it uses the system's JAVAX.DLL but not JAVA.EXE. Domino's Java Runtime Environment (JRE) must be used if Java servlets are to be used. Domino only uses the JRE installed in its code tree, which is \DOMINO\JVM\BIN.

The default for JVM stack and heap allocation for the IHTTP.EXE task are:

```
/* JVM default limits*/  
#define JAVA_DEFMAXHEAPSIZE      (32 * (1024 * 1024))      /* 32MB*/  
#define JAVA_DEFSTACKSIZE        (400 * 1024)              /* 400KB*/
```

Although stack and heap allocation may be altered with the otherwise undocumented notes.ini variables JavaMaxHeapSize= and JavaStackSize=, we do not recommend changing the default values. Doing so may result in virtual memory exhaustion (not physical memory usage.)

5.2 Optimizing the server operating system environment

In this section, we describe how to fine tune your server operating system. We review a few OS/2 tuning parameters that are not described in previous discussions.

5.2.1 Theseus3 for OS/2

Theseus is a memory analysis program for the OS/2 system used to:

- Determine the amount of memory consumed by each process.
- Determine working set information on a system-wide basis or per process.
- Detect memory leaks on a system-wide basis or per process.
- Examine application memory (in hexadecimal notation).
- Examine selected OS/2 system control blocks (formatted).
- Examine selected machine registers and control blocks (formatted).

The THES3000.EXE file, which you can download from the FTP site mentioned below, includes a THESEUS3.INF file that details usage instructions. (To browse .INF files, use the VIEW command from an OS/2 command line.)

Download the latest Theseus product code, which is now called Theseus3 for OS/2, from the following FTP site:

`ftp://ps.software.ibm.com/ps/products/os2/fixes/v4warp/theseus3`

5.2.2 The THREADS parameter

Applications consist of a series of instructions. The sequential execution of the instructions by the CPU is called the thread of execution. More than one thread can exist within a single process.

Several threads can be ready to execute at the same time, but only one thread at a time can have access to the processor. Access to the processor is managed by the system scheduler, which assigns each thread a priority. The thread that has the highest priority, and that is ready to run, is allocated to the processor.

OS/2 Warp Server and Lotus Domino both create threads for various processes. Several threads may be ready to execute at one time and will be scheduled in part through the MAXWAIT parameter in config.sys.

In a previous release, Domino R4 utilized threads based upon the following formula:

$\text{THREADS} = \# \text{ of clients connecting to machine} + 5$

Therefore, we had to increase threads parameter if we wanted to support a large number of users.

In R5, the idea of thread pool is introduced. Therefore, you do *not* have to increase the threads parameter unnecessarily as in the previous release. Domino R5 uses 80 threads by default for TCP/IP users. Other Domino server components use about the same amount of threads.

You should increase the threads parameter if you receive an error message on the server console or database such as the following:

```
At Least One Network Port Requires the Notes Server to Be Restricted to a  
Single Process, and that Process Has Exceeded the Maximum Number of Threads
```

5.2.3 The MAXWAIT parameter

The MAXWAIT parameter in config.sys sets the amount of time for which a ready-to-run thread waits before the system assigns it a higher priority. Decreasing this value in the config.sys file may provide better response time, but at the cost of increased system process handling overhead. You may want to experiment with decreasing the MAXWAIT value.

The default value of three seconds should be acceptable for most Web servers. On a heavily used server, you may find that setting MAXWAIT to 1 gives better performance:

```
MAXWAIT = 1
```

5.2.4 The PRIORITY_DISK_IO parameter

The PRIORITY_DISK_IO parameter in config.sys determines whether any task that is currently running in the foreground is to be given priority disk access over any other task that may be running in the background. This means that the application in the foreground has a better response time than applications running in the background.

During the initial installation of OS/2 Warp, the default value for the PRIORITY_DISK_IO parameter is set to YES in config.sys. For an OS/2 Warp platform running as a server, this setting should be set to NO, giving equal disk I/O to both foreground and background tasks:

```
PRIORITY_DISK_IO = NO
```

5.2.5 Paging (swapping) activity consideration

The less paging that occurs, the better the system performance. Paging occurs when the system needs to expand the installed physical memory by using virtual memory on the disk. Therefore, the starting point to avoid paging is to install enough physical memory. The ideal situation would be that no paging occurs at any given time.

If the swapper.dat file never grows beyond the default (2048 K) file size under the standard workload, the installed RAM size is sufficient. In this case, you do not have to change swapper.dat settings. Ideally, the swapper file on a server should never grow. You may want to consider increasing the file I/O cache until growth occurs in the swapper.dat file.

If swapper.dat grows extensively larger than the default setting, this means that:

- The installed RAM is not enough to hold the virtual storage requested by the system and by application serving.
- File I/O cache (for JFS or HPFS386 or both) was set too high.

In this case, you have to look at paging activities carefully. If you notice extensive paging activities, the following applies:

- The physical RAM should be increased because extensive I/O activity means a RAM shortage for the working set.
- Reduce the I/O cache size to free up memory for system use

To avoid swapping activities, consider reducing the size of file system cache, which results in returning memory to the system.

To increase performance, assuming you have SCSI disks installed, you can change the location of the swap file to a separate physical hard disk. It is also recommended to place the paging file in the root directory for optimal file access time.

To change the swapper.dat file settings, edit your config.sys file and locate the SWAPPATH statement, which is similar to the statement shown below:

```
SWAPPATH=C:\OS2\SYSTEM 2048 2048
```

The syntax for the command is:

```
SWAPPATH=X:\PATH MINFREE INITIAL
```

X:\PATH is the drive and path where the swapper.dat is located. C:\OS\SYSTEM is the default. Change the drive and directory name to indicate the new location of your swap file.

MINFREE The first of the two numeric parameters specifies the amount of free space in KB that can remain on the disk before a warning notifies you that the swapper file has increased to a size that leaves less than this amount on the disk. The warning message is a blank screen with the message *your swapper.dat is full*. We recommend that you increase this value. Remember that this

value does not define the amount of free space on the disk at any given time.

INITIAL The second numeric parameter specifies the initial size of the swap file, and this may have a significant impact on system performance. The default initial size of 2048 KB should be sufficient for a server system, since an OS/2 server is not supposed to swap in the first place. When swapping, though, the operating system dynamically extends the swap file (in 1 MB increments) as required. But, by doing so, this adds system overhead and may cause fragmentation of the swap file, resulting in further performance degradation.

You may modify the initial size of the swapper file up to the size of the free space on the partition containing the swapper.dat. However, you must leave space on the partition equal to the MINFREE value.

The best way to find the right memory configuration is to continuously monitor server memory utilization. You can monitor memory from the Domino server console by running the command:

```
>show statistic mem.*
```

This command outputs statistics similar to those one shown below.

```
> show statistic mem.*
Mem.Allocated = 99755440
Mem.Allocated.Process = 51492660
Mem.Allocated.Shared = 48262780
Mem.Availability = Plentiful
Mem.Free = 304,119,808
Mem.PhysicalRAM = 167157760
```

In the above example, `Mem.Allocated = Mem.Allocated.Process + Mem.Allocated.Shared`. `Mem.Allocated.Process` is the allocated memory in the private address range. `Mem.Allocated.Shared` is the allocated memory in shared address range. `Mem.Availability` tells you overall status of memory usage. `Mem.Free` is available RAM. `Mem.PhysicalRAM` is the size of installed RAM.

To collect memory utilization data automatically, you can set up the *collect* task on one (or more) of the servers to gather the Notes statistics information in your Domino environment. Each server to be monitored must run the event server task and the collector server runs the collect server task. You must also create and configure the Server Statistic Collection document to define the collection interval and servers to be monitored.

5.3 Optimizing the server memory usage

The Domino R5 server has changed its internal structure to provide a scalable and reliable server to support large, enterprise accounts. Allowing mission-critical applications that require scalability and reliability, such as mail/messaging and Internet servers, to run with highly improved Reliability, Availability, and Serviceability (RAS) capability. As a result, the R5 server can provide a server consolidation opportunity to those who have several servers running Domino R4 server and want to consolidate them into a smaller number of servers.

One of the biggest changes is an implementation of Unified Buffer Management (UBM) that is partially ported from DB2 or UDB database design. This work was jointly developed by the IBM database development team and Lotus. The UBM introduces many features, and with them Domino databases can support larger numbers of users than ever before. Here are some improvements in this area:

- Allowing global sharing of data in buffers.
- Providing fair replacement policies of buffered data.
- Integrating I/O control that frees Domino to maintain each database on failure.
- Providing asynchronous cleaning of and prefetching data into the buffers.

For more details about UBM, refer to 5.3.3, “Unified Buffer Management” on page 156. For ODS41, refer to 5.3.5, “On Disk Structure 41” on page 158.

Introducing UBM changes Domino database structure from ODS 20 to ODS 41. The new database structure, ODS 41, comes with many functional enhancements, such as:

- Transactional logging
- Online in-place compaction
- High-performance online backup and restore
- Improved startup time after a failure
- Reduction of actual I/O operation ratio

The I/O subsystem enhancements were introduced in Domino R5, but the design of user session management was already improved by introducing thread pools in Domino R4.6 for OS/2. In a Domino R4 server (except for Domino R4.6 for OS/2), managing one user requires at least one thread, regardless of the user’s activity. This means that if you want to support 1,000

users at a time, the operating system has to be able to provide at least 1,000 threads for users. An R5 server does not require such a large number of threads because of thread pooling.

However, when talking about the maximum number of active users that the Domino R5 server for OS/2 can support concurrently, the number of users is still limited by virtual storage exhaustion.

With R5.0.1a, the maximum number of users is limited by virtual address exhaustion at about 2000 users, even if you use TCP/IP protocol. (NetBIOS protocol only allows around 100 users. See 2.2.2, "Running Lotus Domino R5 on NetBIOS" on page 29.)

In the following sections, we cover some of the core elements in each Domino tuning category and try to provide you with the information required to fine tune your Domino server on the OS/2 platform. If you are running Domino on an IBM Netfinity server, a very good source of information is the *Netfinity and Domino R5.0 Integration Guide*, SG24-5313. This book focuses on the Windows NT platform, but many of the issues discussed there are applicable to OS/2 as well.

5.3.1 I/O tuning considerations

I/O performance is one of the most important aspects for a Domino R5 server. As introduced in a previous section, database design has been significantly enhanced based on an already proven technology — Unified Buffer Management (UBM). In this section, starting with UBM, we discuss many considerations for I/O performance improvement, including:

- Unified Buffer Management
- Transactional logging
- Disk configuration
- Choosing a file system
- Database distribution (multiple mail.box databases)

5.3.2 High Memory support

The size of the database buffer pool can be, in some situations, key to good Domino server performance. The NSFBufferPool size is calculated by the server if it is not explicitly specified by a `nsf_buffer_pool_size_mb=` statement in `notes.ini` or in the server document. The OS/2 Domino Release 5.01a server will calculate a maximum size of 64 MB for the buffer pool due to OS/2 virtual address space constraints.

Although an administrator may explicitly specify a larger amount, in Release 5.01a, doing this will cause an increased risk of running out of virtual memory. With the OS/2 Domino Release 5.02 server, the NSFBufferPool will utilize OS/2 High Memory support if this support is available. OS/2 High Memory support is available on OS/2 Warp Server Advanced V4 SMP and OS/2 Server for e-business products.

OS/2 High Memory support is adjusted by means of the VIRTUALADDRESSLIMIT parameter in CONFIG.SYS. The default value for OS/2 Warp Server V4 is 2048, meaning a program using this support can address up to 2 GB (2048 KB) of virtual memory. OS/2 Warp Server for e-business defaults its VIRTUALADDRESSLIMIT to 1 GB (1024 KB). This default is often adequate; however, the larger the value specified by VIRTUALADDRESSLIMIT, the smaller the size of HPFS386 or JFS disk cache that can be allocated and the smaller number of processes that can be run on the system. In general, to support very large disk cache sizes or a very large number of processes, it may be advisable to set VIRTUALADDRESSLIMIT to 1024.

When OS/2 High Memory support is available, OS/2 Domino Release 5.02 will use it automatically. If NSF_Buffer_Pool_Size_MB= is not explicitly specified, Domino will calculate a buffer size of 80 percent of OS/2 Shared High Memory. For example, if VIRTUALADDRESSLIMIT=1024 is used, the total available High Memory is 512 MB. Of this amount, 64 MB is reserved for High Private Memory, leaving 448 MB as High Shared Memory. Then, Domino server will calculate and use a maximum NSF_Buffer_Pool_Size_MB= size of about 360 MB. With OS/2 Domino Release 5.02 and OS/2 Warp Server for e-business, much larger NSFBufferPool sizes are possible, which may lead to better performance in many environments.

Physical/Virtual Memory Usage

The installed physical memory (RAM) and amount of virtual memory used on the server plays an important role in client/server performance.

The size of NSFBufferPoolMB and HPFS386 or JFS file system cache need to be tuned to the particular hardware and software environment. With VIRTUALADDRESSLIMIT=1024, a NSFBufferPool size of 440 MB is possible, and we have tested this setting with a 640 MB disk cache setting on a system having 2 GB of physical RAM. To be sure, to have a large buffer and a cache requires a large amount of system RAM to support these settings. If a larger NSFBufferPool is desired, an increase to VIRTUALADDRESSLIMIT is needed,

and this will require a reduced file system cache size. The combined size of NSFBufferPoolMB and the file cache have to be balanced against available RAM memory so as to not cause an excessive amount of demand-paging.

5.3.3 Unified Buffer Management

The Domino R4 server has some design restrictions that prohibit supporting a large number of users in an efficient way. There were many different types of buffers (caches) for database data. These buffers are not shared between users or processes. The replacement algorithm of buffered data is not fair and or efficient. As a result, the buffer allocation method is also not very effective from the view point of total system performance. All the restrictions are now solved by introducing the Unified Buffer Manager.

Unified Buffer Management allows databases and temporary files, for example, external sorting temporary files or temporary containers, to be buffered and controlled by the Unified Buffer Manager. This Unified Buffer Manager and its buffers are located between the Domino server components and operating system file system. Regardless of I/O type (bypass cache or use cache), the Unified Buffer Manager uses the file system cache. The buffer is called NSFBufferPool. The same name was used by the R4 server, but the way it works is completely different in R5.

Important

Be very careful when adding to and/or modifying the following parameters in the notes.ini file.

There are two parameters for tuning NSFBufferPool, NSF_Buffer_Pool_Size (NSF_Buffer_Pool_Size_MB) and NSF_Max_IO_Threads. Neither parameter is defined in the notes.ini file by default.

The NSF_Buffer_Pool_Size determines the total size of NSFBufferPool. By default, NSFBufferPool size is allocated as follows:

UsableRAM=	VIRTUALADDRESSLIMIT for systems with greater than 512 MB:
	min(Total Physical RAM, VIRTUALADDRESSLIMIT)
	VIRTUALADDRESSLIMIT for systems less than or equal to 512 MB:
	min(Total Physical RAM, 256 MB) for <= 512 MB

NSF_Buffer_Pool_Size = 1/8 of UsableRAM up to 32 MB
1/4 of UsableRAM up to 128 MB
3/8 of UsableRAM beyond 128 MB

In V5.01a, UsableRAM is never more than 256 MB because High Memory support for the UBM was not available.

NSFBufferPool is allocated at Domino server startup and it is pageable.

To know how effectively the NSFBufferPool is used, use the `show statistic Database.DbCache` command to show you measurement variables.

If Database.DbCache.OvercrowdingRejections increases from 0, this means there are not enough NSFBufferPool or *entries*. How much data can be held in NSFBufferPool is defined by another parameter, NSF_DbCache_Maxentries. This parameter is not defined in notes.ini file by default. By default, NSF_DbCache_Maxentries is $\max(25, \text{NSF_Buffer_Pool_Size}/300\text{K})$. The actual limitation that the system allows is $1.5 \times \text{Maxentries}$.

If Database.DbCache.Hits/Database.DbCache.Lookups begins to go down, NSFBufferPool size will have to be increased. If this decrease is caused simply by increasing user activity, increasing NSFBufferPool size increases the cache hit ratio. If this decrease is caused by introducing a new Domino application, you have to know the highest hit ratio for this new configuration with this application.

NSF_Max_IO_Threads defines the number of threads that will work for the Unified Buffer Manager. By default, $4 + (1 \text{ per } 100 \text{ MB})$ NSFBufferPool threads are created.

5.3.4 The NSF_Buffer_Pool_Size parameter

This parameter specifies the maximum initial size in bytes of the NSF buffer pool. This memory pool is used for I/O buffering between the Notes Index File (NIF) indexing functions and disk storage. The maximum value for initial NSF_Buffer_Pool_Size is 512 MB. Setting the value higher than this does not have any effect.

You can monitor the peak and current values of the NIF and NSF pools, for example, by running the commands:

```
>show statistics Database.NSFPool.*  
>show statistics Database.NIFPool.*
```

The output of the commands may be similar to the following output.

```
>show statistics Database.NSFPool.*
Database.NSFPool.Peak=2,097,152
Database.NSFPool.Used=195,072
>
>show statistics Database.NIFPool.*
Database.NIFPool.Peak=1,048,576
Database.NIFPool.Used=309,184
```

5.3.4.1 NSF_Buffer_Pool_Size_MB

This is the same as NSF_Buffer_Pool_Size, except that the buffer size is entered in megabytes instead of bytes.

Note

It is not recommended to set NSF_Buffer_Pool_Size_MB= manually. The Domino server automatically defines the value for the parameter. Setting the parameters manually can actually degrade the server performance.

5.3.4.2 NSF_DbCache_MaxEntries

This parameter determines the number of databases that a server can hold in its database cache at one time.

Increasing the database cache size can improve system performance but requires additional memory. The minimum number of databases allowed in the cache at one time is 25; the maximum is approximately 2000, depending on the server platform. There is no default value for this parameter, although if this setting is omitted, the number of databases that the server can hold in its cache at one time is either 25, or the NSF_Buffer_Pool_Size value divided by 300 K (whichever is greater). Actual system limitation allows 1.5 x Maxentries.

5.3.4.3 NSF_Max_IO_Threads

NSF_Max_IO_Threads defines the number of threads that will work for the Unified Buffer Manager. By default, 4 + 1 per 100 MB of NSFBufferPool threads are created.

5.3.5 On Disk Structure 41

Domino R5 introduces a new database or storage format, On Disk Structure (ODS) Version 41. This version was developed at an IBM database lab and is better utilized for performance than the earlier version. We strongly recommend that you upgrade all the databases to R5 format (ODS41) to gain

better performance. Please note that this upgrade does not mean upgrading the template.

Recommendation

Upgrade the databases to R5 format to gain better performance.

ODS refers to the method the Domino server uses internally to store the data on the disk device. ODS is totally seamless to the end user. The Domino R5 server fully supports the Domino R4 ODS Version 20 as well, and you can always upgrade a database from ODS 20 to ODS 41, or downgrade from ODS 41 to ODS 20.

When you create a new database on the Domino R5 server, the database storage format is native R5 (ODS 41) by default. If you upgrade a Domino R4 server to R5, the database storage format remains intact until you manually upgrade the format. ODS does not replicate between the server. Therefore, if you have a database on a Domino R5 server (ODS 41) and create a new replica on a Domino R4 server, the database storage format will be ODS 20. This makes interoperability between the different server versions easier.

The ODS version also works seamlessly in reverse. If you have the original database on a Domino R4 server and create a new replica copy on an R5 server, the new replicate will be in ODS 41 format by default.

Note

If you want to make sure that a database remains in R4 format, you can rename the database file extension from .NSF to .NS4. Using the .NS4 file name extension prevents the R5 server from changing the database storage format.

The tool used to change the database storage format is *compacting*. Compact itself is not a new tool, but in R5 there are several new options and features. Compacting in Domino R4 required exclusive access to the database, so users were not able to access the database while compacting was in process. Domino R5 now supports R4 compacting, R4 compacting with client access to the database, new in-place compacting, and new in-place compacting with file size reduction.

In practice, these new compacting styles mean that exclusive access to the database is no longer required. This gives more flexibility for scheduling database compacting.

Compacting a database organizes the internal database structure and, depending on the option selected, also reduces the database file size. Therefore, it is recommended to run compacting on a regular basis.

Hint

For the complete list of options, see “Compact Options” in the online Help file *Domino 5 Administration Help*.

5.3.6 Transactional logging

Transactional logging is a new feature in Domino R5. Transactional logging basically helps with three different areas: performance, crash-recovery, and backing up the data.

When transactional logging is enabled, each Domino transaction is first written to a sequential access file and then later written to the actual database. Accessing a sequential file is always faster than accessing a random-access file, such as a Domino database. Now, the transaction is written to the log and the operation is marked as committed. The actual database change is written to the database when the server is less busy. And this, in turn, results in better performance.

The transaction log is actually a set of sequential files used to store the changes made in the databases. Each file is 64 MB in size, which is why the total log size is always a multiple of 64 MB. Transactional logging can be performed in two styles: circular and archived. You can also decide if all the available disk space on the device can be used, or if the log size should be fixed.

In the circular logging mode, the log files are created at the first server restart after changing the logging options. After all the log files have been filled, the log is wrapped and the oldest actions are overwritten. In the archived logging mode, a new transaction log file is created when needed.

When transactional logging is enabled, in most situations, you may no longer need to run the Fixup task to recover databases following a system failure. Excluding Fixup results in quicker server restarts, since Fixup must check every document in each database, while transaction log recovery applies or undoes only those transactions not written to disk at the time of the system failure.

Transactional logging also enables online backups of databases. Lotus does not provide any backup tools with the Domino server.

Recommendation

Enabling transactional logging may increase Domino server performance. Circular logging is the recommended logging style. The transaction log should be located on a disk device of its own. Placing the log on the same drive as the Domino databases may actually degrade system performance.

Transactional logging is enabled by modifying the server document. Complete the following steps to enable transactional logging for the server:

1. Open the Web browser.
2. To connect to the server to be administered, in the URL field, type:

`http://server_name/webadmin.nsf`

Here, `server_name` is the host name of the server you want to administer.

3. Enter the user ID and password of the administrator.
4. Select the **Configuration** button on the left of the screen.
5. Select the **Servers** button on the top of the screen.
6. Double-click the server you want to configure.
7. Click **Edit Server**.
8. Click **Transactional Logging**.
9. Select the required features as shown in Figure 37 on page 163.

Transactional logging You can disable or enable transactional logging.

Log path

The full path of the transaction log. It is recommended to place the transaction log files on a dedicated disk device to gain the best performance.

You need to create the log directory manually; otherwise, transactional logging will not be enabled.

Use all available space on log device

You can set this if all the free disk space on the transaction log device should be used for the log files.

Maximum log space

This setting does not affect the previous field if set to Yes. In other cases, define the maximum size of the transaction log in megabytes. The log size

must be of a multiple of 64 because each log file is 64 MB. The minimum log size is 192 MB.

Automatic fixup of corrupt databases

You can select whether or not to support the automatic fixup of corrupt databases at server startup. The recommendation is to enable this feature.

Runtime/Restart performance

You can select if the transactional logging should be optimized for runtime performance or server restart performance. Usually, the most suitable options are Standard or Favor runtime.

Logging style

You have two options for logging style: circular or archived. In circular logging, all the log files are created at the next server startup and when the files get full they will be wrapped and the oldest transactions will be overwritten. In archived logging, a new log file is being dynamically created whenever needed.

The recommended transactional logging style is circular. You should only select archived logging if you have Domino-enabled backup software configured.

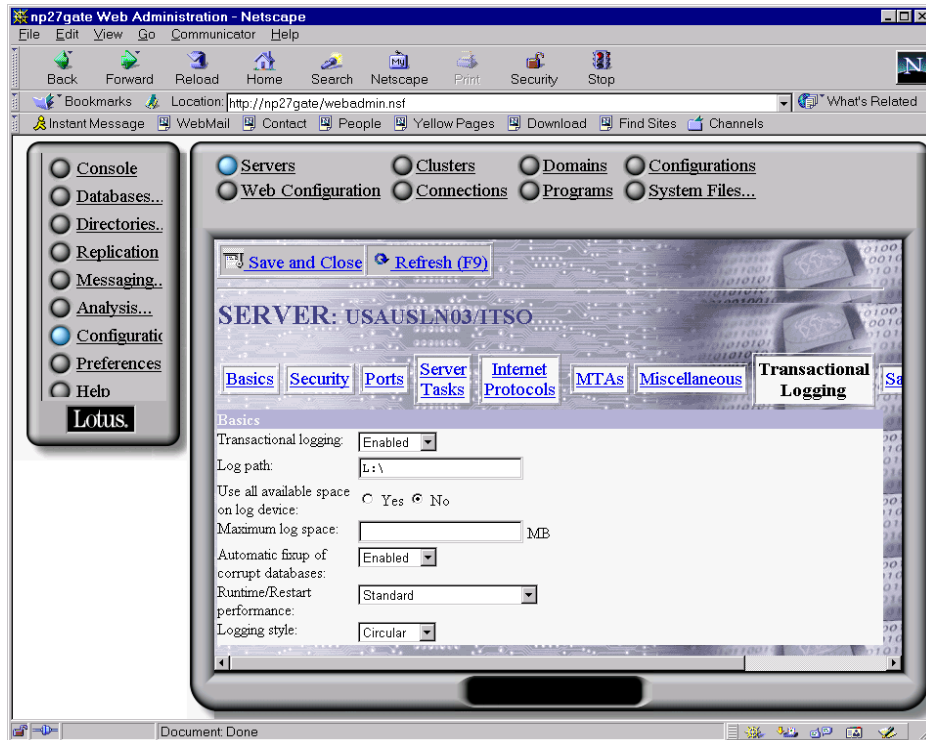


Figure 37. Web Administration transactional logging settings

10. Click **Save and Close** to save the changes.

11. At the Domino server command console, restart the Domino server to apply the changes by typing the command:

```
>restart server
```

The next Domino server restart will take a longer time, up to several minutes, depending on the options selected for logging.

What databases are logged?

A database is logged if:

- Logging is enabled.
- The database is in R5 native format.
- The database is under the Notes data directory tree.
- The database's logging has not been disabled.

5.3.7 File system cache consideration

The file system cache is allocated when the OS/2 system starts up. The cache will serve all the requests from the operating system and applications. Some requests direct the file system to bypass the cache and write the data directory on disk. The Unified Buffer Manager maintains its own NSFBufferPool, and the file system cache is located between the Domino server and disks.

The importance of the file system cache depends on the server role. If the server role is dedicated to a Domino R5 server, the file system cache has the second priority after NSFBufferPool allocation. If the server has a Domino server role and file and print service server role at the same time, the file system cache has the first priority for file and print service, and the second priority for Domino server.

Following the above priorities, you can change the file system cache size to get the appropriate performance. Before changing file system cache settings, we have to know the saturated hit ratio for the cache. This discussion is similar to changing NSFBufferPool, so we do not repeat the discussion here.

If you are using HPFS386, you can see cache information including the cache hit ratio by using the cache386.exe utility. For other file systems, an I/O performance monitoring tool is required such as System Performance Monitor for OS/2, called Theseus/2. Refer to 5.2.1, "Theseus3 for OS/2" on page 149 for more information about this topic.

To change the cache setting for each file system, please refer to 2.2.3, "File system considerations for Domino R5" on page 33.

5.4 Domino server tuning

When speaking about Domino server tuning, we discuss the ways to affect Domino server performance by, for example, editing the notes.ini file, changing the server document parameters, enabling new Domino R5 server features, and distributing the database files properly. The common element is that these factors only affect one Domino server at a time directly and are not really dependent on the hardware you run the server on. But, as mentioned earlier, just changing certain Domino parameters does not guarantee the best utilization for the server. You need to pay attention to the operating system optimization for Domino and Domino network design utilization, making sure that the server hardware is not over-utilized, and that the Domino applications are utilized for performance as well.

Consider these factors:

- Dedicating the server role
- Server tasks selection
- Mail routing
- Changing replication options
- Limiting users
- Changing login options

5.4.1 Server roles

To begin with, you should dedicate the server box for the Domino server only, if possible. Running application servers other than Domino, or using the server for file and print sharing, can compromise the Domino server performance. In small environments, this may not be possible, because the cost of purchasing two or more server boxes may not be in balance with the performance advantage gained.

The main issue is not that Domino is incapable of running alongside other application servers. The biggest concern is CPU, memory, and other resource contention among all applications. Running, for example, two memory intensive applications on the same server can lead to extensive paging, which, in turn, increases disk utilization and degrades performance.

You can, of course, fine tune the applications server to make sure none of the server resources could become a bottleneck. Tuning even one application server is a demanding task, and tuning two or more is even harder.

Recommendation

Dedicate the server box for the Domino server only, if possible, to get the best performance and easier tuning and server administration.

In an enterprise Domino environment, even the decision to dedicate the Domino server to perform just one task can greatly change the client response times, which is, at least from the client's point of view, one of the most important factors. Domino server roles are more a concern of Domino network design than server tuning; see 2.2.6.3, "Domino server roles" on page 55 for more information.

5.4.2 Server tasks optimization

You can define which Domino server tasks are to run on your server in the notes.ini file. The corresponding parameter is *ServerTasks=* and the server tasks are listed after the parameter.

When you install a Domino R5 server, you can select which tasks to run. Anytime later, you can change the setting in the notes.ini file and either add or remove server tasks.

Running unnecessary server tasks can degrade the server performance. Therefore, it is recommended to enable only those server tasks that are really required. For example, if there are several servers in your environment, and certain servers are only used for mail and others for database access only, you probably do not want to run mail routing and calendar server tasks. If the *ServerTasks* is set to run various tasks, for example:

```
ServerTasks=Router, Replica, Update, Amgr, AdminP, Stats, HTTP, maps, calconn,  
sched, POP3, IMAP, LDAP
```

You may want to reduce the tasks run on a database server to its minimum, for example:

```
ServerTasks=Replica, Update, Amgr, AdminP, Stats, HTTP
```

The same discussion applies to the *ServerTasksAtxx* setting in the notes.ini file. This setting enables automatic execution of the server tasks given as the parameter at the desired time of the day. You may want to consider removing non-required tasks.

Because the description of each server task is beyond the scope of this book, refer to “Domino Server tasks” in the online Help file *Domino 5 Administrator Help* for more details.

5.4.3 Mail routing tuning

When a Domino Mail Server receives or sends a message, the mail routing task uses the mail.box file to temporarily store the message. The mail routing task requires exclusive access to the database and, therefore, only one mail routing event can read from or write to the database at one time.

On the Domino Mail Servers, you can now set the number of mail.box files used for mail routing. Defining more mail.box databases on a mail server can improve the overall mail routing performance on heavily loaded servers.

Lotus has provided some guidelines for the number of mail.box files based on the extensive testing. These guidelines are listed in Table 15.

Table 15. Recommended number of mail.box files on a Domino Mail Server

Number of mail users	Number of mail.box databases
1-200	1
201-999	2
1000+	10

Changing the number of mail.box files from one to two gives the most significant change in performance. Increasing the number from two does not typically provide much more of a performance boost. This should explain the recommended figures given in Table 15.

To set the number of mail.box databases, complete the following steps:

1. Open the Lotus Domino Administrator.
2. Open the server to be administered.
3. Select **Configuration**.
4. Select **Server => Configurations**.
5. Select **Add Configuration**.
6. The Configuration Settings page is displayed. Enter the name of the server or servers for the parameter change in the Group or Server name field.
7. Select the **Router/SMTP** tab.
8. Enter the number of the mail.box files.
9. Select the **Save and Close** button to save the settings.
10. Restart the Domino server to apply the new settings.

The required files will be created at the next server startup.

5.4.4 Replication tuning

You can improve server replication performance by running multiple replicator tasks simultaneously. By default, only one replicator task is executed. With a single replicator task running, if you want to replicate with multiple servers at the same time, the first replication must complete before the next one can start.

Set the number of replicators by adding the following entry into the notes.ini file:

```
Replicators=value
```

Where *value* is the number of replicators. All other factors aside, we recommend you set the number of replicator tasks to equal the number of spoke servers with which the hub replicates. However, you should not exceed 20 replicators to avoid putting too much load on the server.

Hint

Replicators = Number of spoke servers.

Bear in mind that your network design may affect the optimal number of replicators for your implementation. If you are replicating over a single 256 Kbps frame-relay connection to your spoke servers, for example, adding extra replicator tasks would not give any performance improvement. This is because the bottleneck is not the replicator task, but the network link itself. With a 155 Mbps ATM, you might see better utilization by changing the value.

5.4.5 Limiting user access to the server

Under certain circumstances, as in the case of a hub server, you may want to restrict the number of users able to access the server. The easiest way to control who may access the server is to modify the server document. By opening a server document and selecting the Security tab, you can find a field named *Access server*. By including users or groups in this field, you explicitly define who is allowed to access this particular server. For example, you can define that only the Administrators group and the server group Local Domain Server can access the system. A second field, *Not Access Server*, lets you define users and groups who are explicitly prohibited from accessing the server.

Note

Although the following settings can be set by editing the notes.ini file, you should create a new Server Configuration document instead with the required parameter changes for easier administration.

5.4.5.1 Server_MaxUsers

You can also limit the number of users that can access your Domino server concurrently. This is done by adding the notes.ini parameter *Server_MaxUsers*. Setting the value to 100, for example, allows only 100

users to open a session with the server. Once this limit is reached, additional users attempting to use the server will get an error message that `Server_MaxUsers` has been exceeded. This parameter does not prevent other Domino servers from accessing the server.

5.4.5.2 `Server_MaxSessions`

This parameter is very similar to `Server_MaxUsers`. The main difference is that this parameter actually limits the maximum number of sessions that can be opened by the server.

Note

This parameter defines the number of user sessions the OS/2 Notes server can accommodate. When a new user attempts to logon, if the current number of sessions is greater than the value of `SERVER_MAXSESSIONS=` (in the `notes.ini`), the OS/2 Notes server closes the least recently used session. In order for a session to be considered for closing, it must have been inactive for at least one minute.

For example, if this parameter is set to 100, and the 101st person tries to access the Notes server, the Notes server drops the least-used session from the server in favor of this new session.

Please note that reducing the `Server_MaxSessions` to a specific number will not prevent the server from allowing more than that number of concurrent active users on the server, but will drop the sessions soon after they become inactive. This frees up resources. Conversely, Notes will not close any session that has been idle for less than one minute, regardless of the demand on the server.

Please be aware that setting the `Server_MaxSessions` parameter will never prevent a user from opening a session on the Notes server. There is presently no way to prevent a user from opening a new session on a Notes server. If there are too many concurrent sessions (active sessions) on the Notes server, errors may occur.

5.4.5.3 `Server_Session_Timeout`

This parameter will cause the Notes server to terminate a session that has been idle for the specified amount of time. A session is considered idle if no activity from the client is detected. Dropping unused sessions saves resources. Setting the `Server_Session_Timeout=` parameter will save resources as long as the server is not extremely busy most of the time.

Please note that 45 minutes is the minimum recommended setting for this parameter. Setting a lower time may cause the server to have to re-open database server sessions too often. This can negatively affect the server's performance since it must re-evaluate the database server sessions as users or other servers recommence their use of the server.

5.4.5.4 MinNewMailPoll

Notes R4 and R5 users can define the new mail polling setting in their user preferences. Extensive polling can decrease the server performance. You can override the user setting by adding this parameter to the mail server configuration.

5.4.6 Logging options

Domino server records defined events in the notes.log file, stored in the Notes data directory. You can improve your server performance by minimizing the number of events that are logged. The amount of disk space used for logging can be reduced by setting an appropriate number of days to retain log documents.

The notes.log file behavior is controlled by entries in the notes.ini file. These can be set by manually editing the notes.ini file or by using the `SET CONFIGURATION` console command. Some can also be modified by making changes to the server configuration document. The variables we discuss here are:

```
Log=logfilename, log_option, not_used, days, size
Log_AgentManager=value
Log_MailRouting=value
LogDirCat=value
Log_Replication=value
Log_Session=value
Log_Tasks=value
Log_Update=value
Log_View_Events=value
PhoneLog=value
```

First, let us take a look at the Log entry. This allows you to set the name of the log file, change logging options, determine the period for which log records are retained, and set a maximum size for log documents.

By default, the log file is named notes.log, the log is displayed to the console, the number of days to retain documents is set to seven, and maximum document size is set to 40000 bytes. This is the entry in notes.ini:

```
Log=log.nsf, 1, 0, 7, 40000
```

You may choose to modify these settings, but the defaults are generally acceptable.

Now, we examine each of the items that can be logged. The following table gives a brief description and the default setting for each of them.

Table 16. Logging options in the notes.ini file

Entry	Valid values	Description
Log_AgentManager	0	Do not log agent execution events
	1	Log all agent execution events
	2	Log only successful agent execution events
Log_MailRouting	10	Log mail routing errors and warnings (minimal)
	20	Log minimal plus transfer output and delivery output (normal)
	30	Normal plus transfer thread information (informational)
	40	Informational plus more details about transfer queues (verbose)
Log_DirCat	0	No Directory Cataloger logging
	1	Log when the Directory Cataloger starts, which Domino Directories the Cataloger runs on, and when the Directory Cataloger finishes
Log_Replication	0	Do not log replication events
	1	Log server replication events
	2	Log replications at the database level
	3	Log replication events at the database element level (views, documents)
	4	Log replication events at the field level
	5	Log summary information
Log_Sessions	0	Do not log individual sessions
	1	Log individual sessions
Log_Tasks	0	No logging for server tasks
	1	Log the status information of server tasks

Entry	Valid values	Description
Log_Update	0	Log the indexer startup and shutdown
	1	Log the indexer startup and shutdown and view and full text index updates
	2	Same as 1, but also logs the names of the view being indexed
Log_View_Events	0	Do not log view rebuilds
	1	Log view rebuild events
PhoneLog	0	No phone call logging
	1	Log calls except those failed by busy signal
	2	Log all phone calls

5.4.7 Application tuning considerations

One more factor to keep in mind is Domino application tuning. The starting point is that the application design pretty much dictates the application performance. Using effective and well-designed algorithms and structures in the application development phase is the best way to succeed.

After the database or application is ready to be rolled out to the production environment, there are still several things left for performance tuning. Lotus has published a very good white paper on this subject. You can find this document at URL:

<ftp://ftp.lotus.com/pub/lotusweb/product/domino/domperform/maxperformancedomino.pdf>

Database optimization settings can be set in the database properties. Or, if you are running an R5 Administrator, you can access the same settings by opening the **Files** tab and selecting **Advanced Properties** from the tool panel.

The setting available are:

- Don't maintain unread marks
- Document table bitmap optimization
- Don't overwrite free space
- Maintain Last Accessed property
- Don't support specialized response hierarchy

- Don't allow headline monitoring
- Limit entries in \$UpdatedBy fields
- Limit entries in \$Revision fields

For more help on these settings, refer to *Domino 5 Administration Help* or to the Lotus white paper mentioned earlier in the section.

5.5 Optimizing your network environment

Network design optimization can be very complex and is beyond the scope of this document. However, one way of optimizing your networking subsystem is to optimize the protocols used by your client and server machines and which protocols are enabled at your Domino servers.

With Domino R5, you need to run the TCP/IP protocol. If possible, as discussed in previous sections, make TCP/IP your sole communications protocol among Domino servers and Notes Clients.

Domino R5 supports a variety of protocols, but some of the Domino features are specially optimized for TCP/IP, for example, Domino clustering.

5.5.1 Network protocol

We recommend that you use TCP/IP as your primary networking protocol for Domino R5. Domino supports a number of protocols, including TCP/IP, SPX/IPX, and NetBEUI/NetBIOS. Network protocols, such as NetBIOS, may impose limits on the number of connections your server can support. Using TCP/IP, the number of connections is limited only by the server capacity to process the network traffic. Using TCP/IP also gives you also considerable freedom in your choice of client platforms, since you can use the HTTP server capabilities built into Domino to allow client access using Web browsers, as well as regular Lotus Notes Clients.

This release of Domino has been optimized for TCP/IP. TCP/IP has some other advantages. For example, the protocol is routable, which means it can be run natively on WAN over routers.

For more information, see 2.2.1, "Running Lotus Domino R5 on TCP/IP" on page 28.

Names resolution plays quite an important role in networking. In addition to the protocol level of name resolving, the Domino servers may use Notes RPC Communications, which offers a name service and provides a Domino

server's protocol-specific name or address when requested. This name service provides the link between the platform name and Domino server name.

5.5.2 The Notes name service

The Notes name service uses information in a Server document from the Net Address field for each configured port. When the user's home server is started, a table is built containing information about another server in the same Notes named network that the server belongs to. The Notes workstation makes name service requests to the server for the information.

The name service information is valuable when:

- The Domino server's name is different from the protocol-specific name or address.
- A numeric IP address is needed in order to reach the server.
- The Net Address field contains the server's common name. This same server name is used for all protocols the server will be accessed by.
- The Net Address field does not contain the same server name when there is a second instance of the same protocol using the same transport layer.

5.5.3 Port encryption

The performance report, *Optimizing server performance*, by James Grigsby, Carol Zimmet, and Susan Florio Barber, describes the differences between enabled and disabled port encryption. This report can be found at the following URL in the Iris Today section:

<http://notes.net/>

Following is some information from this report.

You can encrypt network data on specific ports to prevent network eavesdropping with a network protocol analyzer. Network encryption occurs at the network transfer layer of a selected protocol. Network data is encrypted only while it is in transit. Once the data has been received, network encryption is no longer in effect.

Network data encryption occurs if you enable the encryption on either side of a network connection. For example, if you enable network data encryption on a TCP/IP port on a server, you do not need to enable encryption on the TCP/IP ports on workstations or servers that connect to the server.

Multiple, high-speed encrypted connections to a server can affect server performance. Encrypting network data has little effect on client performance.

In testing port encryption versus no port encryption, the relative CPU utilization was in the 5 to 10 percent range for 500, 800, and 1,000 active users.

In the less than 60 percent CPU utilization range, what the test result says is:

- There is an incremental impact of port encryption on system utilization.
- There is an incremental impact of port encryption on end-user response time.

The results of tests led us to the conclusion that using port encryption increased CPU utilization by 5 to 10 percent. This means that you can turn on port encryption without worrying about a performance impact for your users' response time when the overall system utilization is in the less than 60 percent range.

To enable port encryption:

1. From the Domino Administrator, choose the server for which you want to encrypt network data.
2. Click the **Server - Status** tab.
3. On the tool bar, choose **Setup Ports**.
4. Select a network port in the Communication Ports box.
5. Select **Encrypt network data**.
6. Click **OK**.

5.5.4 Domino R5 TCP/IP drivers and session considerations

TCP/IP drivers are installed in the Domino program directory during Domino installation. When you select a network port during the Domino server or Notes workstation setup procedure or add a port later, ensure that TCP/IP is selected as a network choice, and Domino uses the appropriate network driver to configure the port.

The TCP/IP network driver can coexist on a Domino server or Notes workstation with any other supported network driver.

5.5.4.1 TCP/IP listener and thread pool

Domino R5 has changed its design to support additional TCP/IP users. By default, 40 threads are prepared for TCP/IP users as pooled thread and users

are dispatched by TCP/IP listener tasks to each pooled threads. You can see how many threads are working concurrently by using the following command:

```
SHOW STATISTIC Server.Task.Db.
```

The output from this command may look similar to the following output:

```
Server.Task.Db = Database Server: Perform console commands: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Thread pool member on TCPIP: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Thread pool member on TCPIP: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Thread pool member on TCPIP: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Thread pool member on TCPIP: [07/21/1999 14:32:19 CDT]
(same output lines come here)
Server.Task.Db = Database Server: Thread pool member on TCPIP: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Thread pool member on TCPIP: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Thread pool utility task on TCPIP: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Listen for connect requests on LAN0: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Listen for connect requests on LANlip: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Load Monitor is idle: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Perform housekeeping chores: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Idle task: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Perform Database Cache maintenance: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Idle task: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Idle task: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Idle task: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Idle task: [07/21/1999 14:32:19 CDT]
Server.Task.Db = Database Server: Idle task: [07/21/1999 14:32:19 CDT]
```

Thread pool member on TCPIP shows each thread that is pooled for TCP/IP sessions. Therefore, supported maximum connections do not restrict the number of users that can connect to Domino R5 server at the same time. If you see these threads used up frequently, consult Lotus and change the number of threads allocated for pool. This can be done by specifying the `Server_Pool_Tasks` parameter in the `notes.ini` file. These threads are used only by Notes Clients that use TCP/IP protocol. Web clients do not use these threads.

5.5.4.2 TELNET, FTP, and NFS configuration considerations

To ensure data security, configure all TCP/IP Domino servers to reject TELNET and FTP connections and do not include Domino servers that use TCP/IP protocol in the Network File System (NFS). Using these services requires that you properly maintain the TCP/IP password file to guarantee a secure environment on the system. With NFS running in a non-secure environment, it is possible to breach security by accessing the files through the NFS system instead of through the Domino server.

5.5.4.3 TCP/IP connection attempt timeout

For Notes Clients, there is a connection timeout field in the TCP/IP Port Setup dialog box. To get to this setting, for Notes Client, choose **File => Preferences => User Preferences => Ports => TCPIP Options**. To change

this setting, replace the default of five seconds with the number of seconds you want for the timeout on the TCP/IP connections.

For the server, unfortunately, there is no user interface to change TCP/IP timeout value except for changing the notes.ini file itself. You can change the notes.ini value through Lotus Domino R5 Administrator using the Notes.ini tab from the configuration page. This is a difference from the previous Version R4.6. To change the connection, attempt timeout for port name TCPIP for 90 seconds. See the following sample in the notes.ini file:

```
TCPIP=TCP,0,15,0,,12288,
```

Add the line:

```
TCPIP_TcpConnectTimeout=0,90
```

This timeout setting applies only to the first time that the workstation or server attempts to establish a session with another Domino server. For example, this applies when a user tries to open a database on a server, or when a server attempts to connect to another server to replicate.

Domino uses the timeout setting to determine when to terminate the attempt to establish the session. For dial-up connections that often require more time than LAN connections, you might want to increase the timeout period.

5.5.5 Domino with multiple TCP/IP ports

Domino supports many types of TCP/IP configurations using multiple TCP/IP ports. In most cases, only one TCP/IP port is necessary. However, you may need multiple TCP/IP ports in, for example, a firewall configuration, clustering, backup port configuration, partitioned server configuration, and so forth. Domino automatically listens for TCP/IP connections on all network interfaces. You do not need to configure additional TCP/IP ports unless you want to control and separate specific types of traffic, for example, replication and routing, or provide extra security to specific types of TCP/IP traffic, for example, LAN and Internet. Domino servers and Notes workstations support multiple TCP/IP ports.

Multi-homed hosts are computers that have two or more physical connections, for example, multiple network cards, that require multiple IP addresses. Routing between each network segment is performed by the TCP/IP stack, and thus, only one TCP/IP port driver needs to be configured to manage Domino traffic. Alternatively, Domino can be configured with multiple TCP/IP ports, allowing more control over network traffic and network segments, and needing more complex configuration and administration.

Note

It is important to note that by adding another network card and TCP/IP port, there is no impact on the amount of Domino sessions obtainable on a Domino server. For TCP/IP, the machine's capacity is dependent upon processors and memory.

The following are examples of multiple TCP/IP port configurations:

Example 1: Load balancing network traffic by spreading it across parallel network segments

Essentially, if you have two network cards, you have two networks. One network may be used heavily, the other not as heavily. The load is balanced by directing destination traffic to a specific port on that server using connection records that ensure using the right network to connect to a given target server.

Example 2: Dedicated LAN for Domino clustering

Domino clustering requires databases to be updated at the same time. For this purpose, high-speed, dedicated LAN is recommended. Encryption is not required for this LAN traffic.

Example 3: Hub that communicates with spokes over separate network segments

Domino networks may be logically segmented by the administrator based on throughput requirements. For example, all Notes workstations may be targeted for one particular network/NIC, while all Domino server traffic is destined for another network/NIC. A port must be configured for each network/NIC and managed by connection records, as explained at the end of this section.

Example 4: Security benefits and customized TCP/IP options

In some configurations, a host serves as a gateway to the Internet and the LAN. For performance purposes, a TCP/IP port may be configured for unencrypted Domino traffic, while another port may be configured for encrypted Internet Domino traffic. Performance on the LAN is more efficient with encryption disabled.

The following steps demonstrate how to set up multiple TCP/IP ports:

1. Make sure that the TCP/IP networking software is configured properly and that each installed network interface card has a *unique IP address* that

you can ping.

If you have installed TCP/IP as the network driver, the first port should already be configured.

2. To add a new port, edit the notes.ini file. The syntax is shown below:

```
portname=drivename,0,15,0,,12288
```

For example,

```
TCP2=TCP,0,15,0,,12288
```

3. Change the Ports statement in notes.ini to add TCP2 port:

```
Ports=TCP,TCP2
```

4. Add a line for each port defined above, stating its IP address and port number as represented by the following:

```
portname_TcpIpAddress=0,IP Address:port number
```

Where portname is the port name you defined.

The port number can be any number higher than 5000 or any unused TCP/IP port number. The default is 1352.

For example, given ports TCP and TCP2, the following lines should be added:

```
TCP_TcpIpAddress=0,192.168.100.13:1352
```

```
TCP2_TcpIpAddress=0,192.168.100.12:1352
```

To connect to the server with multiple ports configured with a different port number from the default, a connection record has to be created or changed.

From a workstation:

1. Add a connection record in the Personal Address Book for the Domino server with multiple cards.
2. Type the server name and IP address in the network field.

From a server:

1. Add a connection record in the Domino Directory.
2. Enter the server name and IP address in the Network field.
3. Edit the Server document. Add and enable the new port, specifying the same name given to the new port.

5.5.6 TCP port number used by Domino

To use a different port number for servers, configure the TCP/IP service Lotusnotes in a manner appropriate to the network. This is generally done by

adding a line to a file named `services`, which is usually located in a directory called `\mptn\etc`. The line should resemble the following:

```
Lotusnotes portnumber/tcp # LotusNotes
```

Where `portnumber` is the port of your choice. Be sure to edit this file on every Notes workstation and Domino server that is communicating.

For example, to change the port number to 1355, add a `Lotusnotes` entry in the service file as follows:

```
applix          999/udp          #    Applix ac
cadlock         1000/tcp         #
ock             1000/udp         #
kpop            1109/tcp        #    Pop with Kerberos
Lotusnotes     1355/tcp        #    LotusNotes
ingreslock      1524/tcp        #
# Andrew File System services
filesrv         2001/tcp        #
rauth2          2001/udp        #
```

5.5.6.1 Using different TCP/IP port numbers

By default, Domino servers use the TCP port 1352 when listening for Notes workstation connections. This port number was assigned to Lotus by the Internet Assigned Number Authority, so it is unlikely that it conflicts with other applications on the network. Notes workstations use dynamic port numbers that the TCP/IP network software chooses from a range of numbers that are available for this purpose. A workstation that connects to a Domino server connects to server port 1352.

It is not recommended that you change a Domino port number. However, in some cases, for example, configuring separate Notes networks for security reasons, different port numbers have to be configured.

Note

Two port drivers can listen on the same network card (IP address) only if they are configured with different port numbers.

To configure different port numbers on the same IP address, change the `portname_TcpIpAddress` lines in `notes.ini` file as shown below.

The port name line syntax in the `notes.ini` is:

```
PORTNAME_TcpIpAddress=0, IP Address: port number
```

The following sample configuration is valid since it uses a different port number:

```
TCP_TcpIpAddress=0,192.168.1.1:5000  
TCP2_TcpIpAddress=0,192.168.1.1:1352
```

The following sample configuration is invalid since it uses the same port number and same address:

```
TCP_TcpIpAddress=0,192.168.1.1:1352  
TCP2_TcpIpAddress=0,192.168.1.1:1352
```

Each Domino server and Notes workstation connecting with port number 5000 must have their services file changed for that port number, or, for example, you can enter this in the Network field in the connection record as 192.168.1.1:5000. Note that you need to type in your IP addresses rather than the ones shown in our example.

5.5.7 Adding ports for NetBIOS protocol

The Domino Web-based configuration program will configure all the available LANx ports for the Domino R5 server by default. You can change the port configuration after the installation by using the Domino Administrator or the Domino Web Administrator browser interface.

Using one of those, you can change the port configuration by opening Current Server Document as shown in Figure 38 on page 182. In this figure, five ports are already defined on the server. LAN0 is a NetBIOS port driver and LANn (n=0, 1, 2, and so on) is a NetBIOS port driver name configured on NetBIOS over TCP/IP.

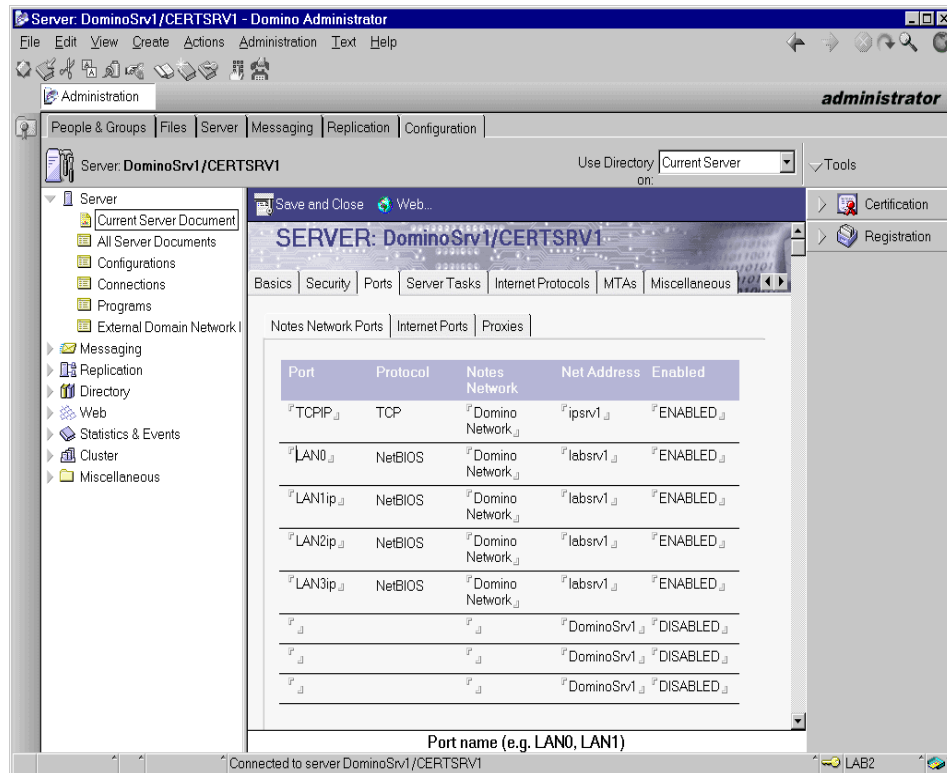


Figure 38. Changing the port configuration through Lotus Domino Administrator

From the Web client:

1. Open the webadmin.nsf database from the Web browser.
2. Select the **Configuration** button on the left.
3. Double-click the server you want to change.
4. Click **Edit**.

You can change port configuration as shown Figure 39 on page 183.

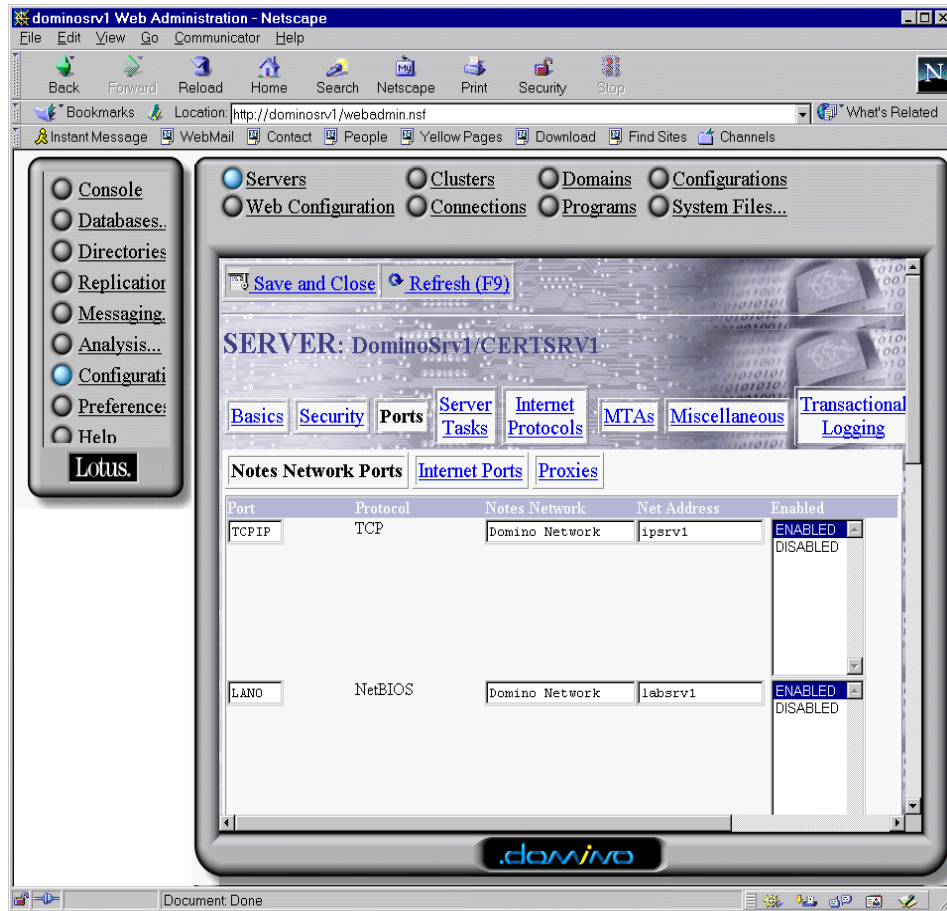


Figure 39. Changing the port configuration through the Web client

5.5.8 Configuration parameter for iibmeenb.dll port driver

The following parameters are no longer valid for the Domino R5 server:

- NETBIOS_lana_resource_program
- NETBIOS_resource_program
- NETBIOS_resource

These parameters are for the R4.x iibmeenb.dll port driver, which is no longer included in R5.

5.5.9 SHOW PORT command for NetBIOS port driver

To monitor or troubleshoot network activity on a Domino server or Notes workstation, use the Domino server console to check the status of the network port.

The `SHOW PORT LANx` or `LANxip` command lists the following port status:

Aborted transmissions	Network transmissions that are canceled. May indicate problems with the network card. Run diagnostics and replace the card if necessary.
Adapter name table	Names by which the server and applications running on it are known by non-Notes and non-Domino computers and applications on the network. A name can also be part of a NetBIOS group, which is identified in the table as "grp.". (Name 5 is the server name. The first 15 characters are blank-space filled; the 16th character is a + sign.) You need to know this format if the server communicates through a bridge that uses manual name registration.
Adapter resources	Current status of the network adapter card. You can use these statistics for fine tuning network performance. For example, if the number of sessions in use is equal to the maximum number of sessions, you may want to increase the maximum number of sessions in the network configuration file.
Adapter session table	Status information about current network sessions. You can see information such as the Local Session Number (LSN), the state of the session (Listen pending, Session created), the local and remote names, and the number of Receive and Send commands pending. On lines that contain "Listen pending" in the State column, an asterisk (*) in the Remote Name column means receive connections from anyone.
Alignment errors	Network alignment errors reported on this port. Alignment errors occur when the number of bits received is not a multiple of 16; therefore, the boundary between characters is ambiguous. This is considered a frame error

and may indicate that a new NIC is needed. Bad data packets or loose cables may also cause alignment errors.

Available command blocks	Number of available NetBIOS control blocks. If this drops to a low number, the Domino server may not be able to support additional users.
Collisions	Network collision errors reported on this port. Caused when packets on the network collide and are damaged; could be caused by a loose cable. If you use Ethernet, it may happen.
CRC errors	Number of Cyclic Redundancy Check (CRC) errors reported on this port. CRC is used for message transmission and reception verification. CRC errors mean that the CRC included in the frame does not match the calculated CRC for the frame. CRC errors cause retransmissions and network degradation and can be caused by bad data packets or loose cables on a network port.
Maximum sessions	Number of sessions configured for this server. Compare this number to the number of sessions in use.
Network unit status	The revision number of the network software.
Number of packets dropped	The network drops packets when there is no buffer ready to receive them. This may be caused by insufficient link-support buffers or by transmissions from a fast network.
Packets received	Number of network packets received on this port.
Packets transmitted	Number of network packets sent from this port.
Reporting period	Collection time for statistics.
Retransmissions	Network transmissions that were retried. Packets are retransmitted when they do not reach their destination the first time. Causes include CRC errors, alignment errors, collisions, and aborted transmissions.

Session data packet size	Varies depending on the network. In NetWare, it is the maximum amount of data it can send in a single packet.
Sessions in use	Active sessions. If the number of sessions in use is equal to the maximum number of sessions, you may want to increase the maximum number of sessions in the network configuration file.
Total command blocks	Total number of configured command blocks. Should be set to 1-1/2 times the number of sessions.
Traffic and error statistics	Shows the communication activity on the port. Used for troubleshooting network hardware or tracking network performance.

5.5.10 Which protocols to enable or disable

Enabling or disabling the SSL protocol can greatly affect server performance. SSL encryption and decryption requires many processing cycles. Therefore, it is recommended not to enable the SSL protocol unless absolutely required.

You should also consider disabling all the non-required protocols from the Domino port configuration. The recommended protocol for Domino is TCP/IP, but Domino supports several other protocols including SPX/IPX, NetBIOS, and NetBIOS over TCP/IP.

5.6 Optimizing the client environment

This section provides a comprehensive overview of tuning Netscape and the OS/2 Java Virtual Machine (JVM) to obtain optimum performance in an all-Notes-browser system environment. It also details performance issues related to the OS/2 Domino R5 server and OS/2 Warp clients that access the Domino server through the Notes Web browser client with Netscape 4.61.

5.6.1 Roadmap for client tuning

The following roadmap shows a sequence of client tuning:

- OS/2 Warp 4 Fat client
- Netscape
- Java 1.1.8
- Performance charts

5.6.2 Tuning the OS/2 Fat client for performance

There are several issues with OS/2 that can contribute to slow startup of applications. The most significant problem is limited disk caching. OS/2 Warp, using its 16-bit implementation of the High Performance File System (HPFS), only allows up to 2 MB of memory to be used for caching of file I/O. However, the Notes Web browser client's footprint of binaries (GIF, PRO, and JAR files) is fairly low. Setting the HPFS I/O cache to 2 MB ensures that all Notes Web browser client applets, once loaded, can be held in the system cache assuming no other applications take over that cache. The I/O cache memory size is set in the CONFIG.SYS file:

```
IFS=C:\OS2\HPFS.IFS /CACHE:2048 /CRECL:4 /AUTOCHECK:C
```

There is some disk I/O to get the code into system memory before it can be activated.

The CONFIG.SYS file may also include a `DISKCACHE` statement. This I/O cache is used for FAT partitions only. If you don't use FAT partitions on your system, we recommend setting the statement from:

```
DISKCACHE=D,LW
```

Which accounts for 30 percent system memory to be used (in this case wasted) as disk cache, to:

```
DISKCACHE=48,LW
```

Which allocates 48 KB of FAT I/O disk cache. On memory-constrained systems, you may even delete the `DISKCACHE` line entirely. As for the paging file, SWAPPER.DAT, which resides in the \OS2\SYSTEM directory by default, the following rule applies:

The more memory your system comes with, the smaller the paging file should be. For example, if your system comes with 128 MB of RAM, the following SWAPPATH statement is recommended:

```
SWAPPATH=C:\OS2\SYSTEM 4096 1024
```

The first parameter, minfree, set to 4096 in our example, specifies the amount of free disk space in KB that remains on the disk before a warning notifies you that the paging file has increased to a size that leaves less than this amount on the disk. In our example, it is set to 4 MB. The second parameter, 1024, specifies the initial size in KB of the paging file.

You should monitor the size of the paging file. On memory-constrained systems, it makes sense to pre-allocate the paging file. The best way to do it is to look at the SWAPPER.DAT file under normal use and preallocate it at

that size, rather than always starting at 1 MB and growing it. This rule, by the way, also applies if you are not on a memory-constrained system.

In our scenarios with 32 MB machines, we noticed the SWAPPER.DAT file would grow up to 42 MB. Applying the rule mentioned above, we set the initial size to 49152 KB (48 MB). However, be aware that you must leave space on the partition equal to the minfree parameter. For examples on setting the swap file, see Table 19 on page 194.

5.6.3 Loading Java applets within Netscape

The Notes Web browser client loads a mixture of JavaScript commands and Java applets, which could imply that loading Java applets locally from the \NETSCAPE\PROGRAM\JAVA\CLASSES directory rather than downloading them from the Domino HTTP server helps increase performance. Sounds promising, but installing the applets locally will not work in Netscape (in Windows or OS/2) without changes to the applets. Due to Netscape's security model, if the applets are installed locally, they must request permission to connect back to the server to download data and necessary images or to use LiveConnect to communicate to JavaScript. Currently, the applets do not request the necessary permissions.

Table 17 lists and describes the applets used by the Notes Web browser client.

Table 17. JAR files used by the Notes Web browser client

Name of JAR file	File Size in bytes	Intended use
ACTIONBAR.JAR	13,690	Action bar applet.
EDITOR.JAR	125,489	Rich text editor, used for composing mail and also entering any rich text on the Web.
NCSOC.JAR	810,624	This one is actually not an applet. NCSOC.JAR contains the backend classes accessed through CORBA.
NVAPPLET.JAR	105,569	This is the view applet. It mimics a Notes view on the Web.
OUTLINE.JAR	56,637	Outline applet.

Note

There is no applet for the calendar function in Notes. JavaScript is used instead. Therefore, there is no performance degradation due to loading additional applets.

If you typically use mail functions using your Notes Web browser client, the only applets loaded are ACTIONBAR.JAR, EDITOR.JAR, OUTLINE.JAR, and NVAPPLET.JAR, which account for 301,385 bytes. Relative to loading those applets, no particular tuning steps need to be undertaken.

5.6.4 Tuning Netscape parameters

Remote resource caching in Netscape 4.61 is implemented as follows:

- Any required remote resource is brought over the network and cached in the designated Netscape caching space.
- Netscape did not implement a mechanism for pinning required resources in the cache, so a copy is made of any activated resource in a temporary directory that persists for the duration of the applet. Since the applets the Notes Web browser uses are very small, this behavior does not really slow down performance.

After a clean install of Netscape Communicator 4.61, if you select **Edit => Preferences** from Netscape's action bar, and select **Cache** in the expanded Advanced tree, the following cache values are pre-configured for you as shown in Figure 40 on page 190.

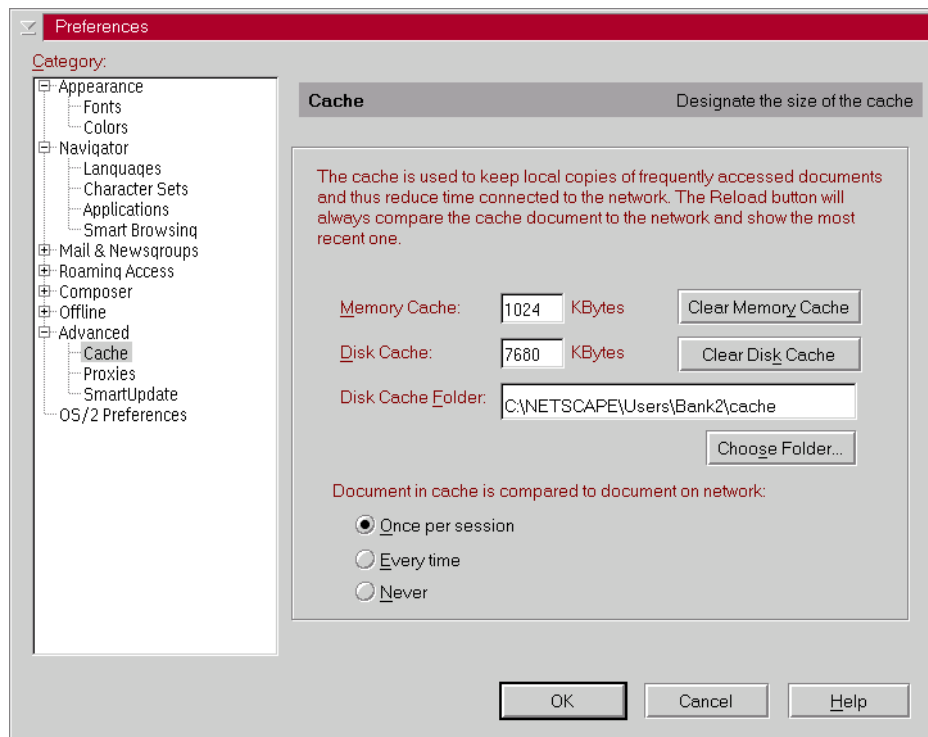


Figure 40. Netscape cache settings notebook

If your system comes with at least 64 MB of memory (more is better), we recommend setting the memory cache and disk cache settings higher. Consider increasing cache size by using Table 18 as a general recommendation on how much to increase Netscape's cache settings.

Table 18. Recommended cache settings in Netscape

Cache settings	Default	Recommended setting
Memory cache	1,024 KB	2,048 KB or 4,096 KB
Disc cache	7,680 KB	16,384 KB

If your client machines are configured with less than 64 MB of memory, for example, with only 32 MB, we cannot advise you to use a Network Computing solution. Browser clients need a lot of memory to perform well. 64 MB is a good start; however, as with all other operating systems on the market today, more memory is always better.

There are three `about:` query commands in Netscape that can display the current cache usage. Type the following commands in Netscape's command line:

- To display the current cache contents in Netscape's cache directory, type:

```
about:image-cache
```

- To display the current cache contents in the system cache, type:

```
about:memory-cache
```

- To display the statistics of the disk cache, type:

```
about:cache
```

These commands can help you to determine cache usage in your system. In general, to achieve best performance of applets, Netscape's system cache should be set big enough that applets can be held in here. Since the applets in Notes Web browser are fairly small, this is an easy task to accomplish.

5.6.5 Tuning the Netscape Java Environment

Netscape for Windows comes with its own Java engine. However, in an OS/2 environment, Netscape uses the OS/2 system JVM. We strongly recommend using IBM OS/2 Warp Developer Kit, Java Technology Edition, Version 1.1.8, available for free from Software Choice. To obtain a copy, point your Web browser to the following Web site:

```
http://www.ibm.com/software/os/warp/swchoice
```

Please also consider installing the refresh version of IBM OS/2 Warp Developer Kit, Java Technology Edition, Version 1.1.8 available from the following FTP site:

```
ftp://ftp.hursley.ibm.com/pub/java/fixes/os2/11/118
```

The directory contains the `RUNTIME.EXE`, `SAMPLES.EXE`, and `TOOLKIT.EXE` files. These files are self-extracting executables and must be installed from the root directory into the previously installed Java 1.1.8 Version.

Classes that are in the `CLASSPATH` get loaded very efficiently by the JVM class loader. Any classes that are not in the `CLASSPATH` must be loaded by some other class loader. Prior to Java Plug-ins, classes required by an applet were loaded by an Applet Class Loader that was implemented in the browser code. This class loader has extra work to do to enforce the integrity and security of the classes that have been imported to the system rather than being natively installed.

For any class that an Applet Class Loader wants to load, it must first call the JVM to load the class. The JVM searches the CLASSPATH, and when the class is not found, it throws an exception (throwing and catching exceptions is expensive). Only then can the Applet Class Loader search the remote resources to resolve the class. This means that an exception is thrown and caught for every class that is resolved by the Applet Class Loader. A good way to shorten the exception handling time is to minimize the CLASSPATH within Netscape. By default, Netscape uses the system CLASSPATH that was set in the CONFIG.SYS file. To check on the current CLASSPATH, open an OS/2 window and type the following command at the command prompt:

```
SET CLASSPATH
```

Check the output to ensure that \JAVA11\LIB\CLASSES.LIB appears first in the CLASSPATH before any other classes. In addition, check the LIBPATH variable in the CONFIG.SYS file and ensure that this path starts with C:\JAVA11\DLL.

As shown in Figure 41, to make changes to the Netscape Java environment, select **OS/2 Preferences => IBM Java Properties** in the properties settings notebook.

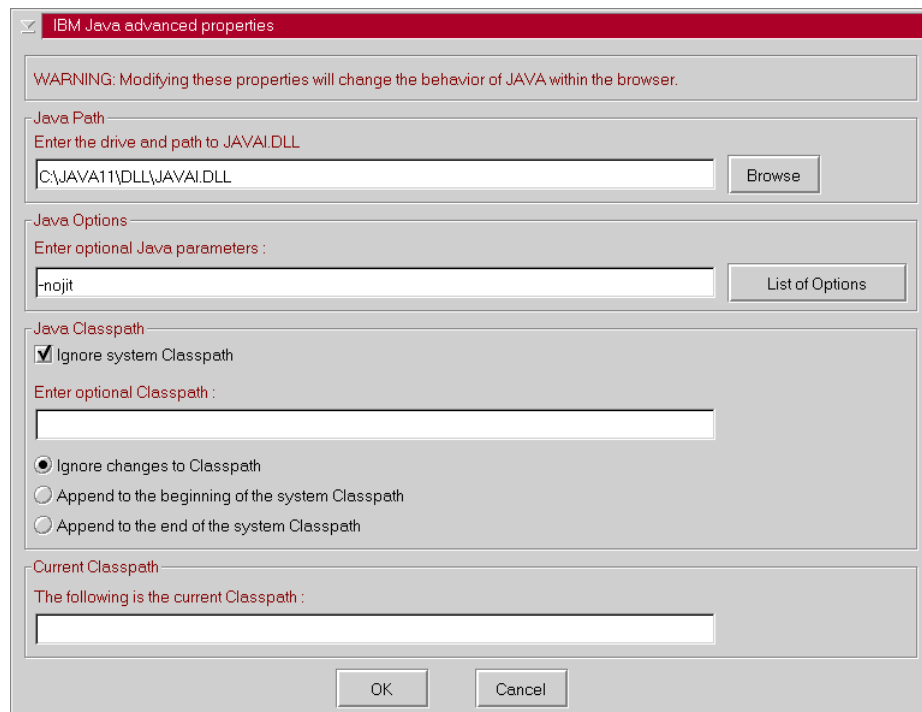


Figure 41. Netscape Java properties settings notebook

We recommend making the following changes:

1. Have Netscape ignore the system CLASSPATH by checking the box for **Ignore system Classpath**.

CLASSES.ZIP is always internally included from the \JAVA11 directory (or equivalent), depending on where JAVA1.DLL was loaded from. If you set the optional CLASSPATH to include that file, you are needlessly lengthening the overall CLASSPATH Netscape will use.

2. Include `-nojit` in the optional Java parameters field.

This saves startup time when loading the Notes Web browser client. (See Table 19 on page 194 for examples.) Overall applet performance is not degraded by doing so.

Duplicates of JAVA1.DLL?

To successfully work with the Notes Web browser client, check your system for multiple copies of JAVA1.DLL, which is basically the heart (interpreter) of a JVM. If there is a traditional Notes Client or other Java applications installed on your machine, there may be multiple Java environments installed too. To optimize the machine's Java environment, check the CONFIG.SYS file and make sure that the LIBPATH starts with C:\JAVA11\DLL to have your machine always work with the system JVM. The system PATH should start with C:\JAVA11\BIN. If the Notes Web browser client doesn't work, check the C:\POPUPLOG.OS2 file and see whether it says JAVA1->JAVAR._strtodieeee in your trap information. This error message indicates that your Netscape browser is using the wrong Java interpreter.

IBM OS/2 Warp Developer Kit, Java Technology Edition, Version 1.1.8, when loaded, allocates 4 MB of heap memory by default. The JVM is smart enough to dynamically grow and shrink the heap memory when necessary. Relative to the size of applets loaded with the Notes Web browser, no tuning steps need to be undertaken.

5.6.6 Performance charts

Throughout the writing of this redbook, we ran several performance tests with the new Notes Web browser on OS/2. Table 19 on page 194 illustrates the response times of several actions that were performed on IBM PC 300GL, 266 MHz Pentium machines with 32 MB and 64 MB of RAM.

Table 19. Netscape and Notes browser client performance

Action	64 MB Machine	32 MB Machine
Initial Swap File Size	1,024 KB	49,152 KB
Netscape Memory Cache Size	2,048 KB	
Netscape Disk Cache Size	16,384 KB	
HPFS I/O Cache Size	2,048 KB	
OS/2 LAN Requester Started?	Yes	
Loading Time for Netscape ¹	7 secs	11 secs
Displaying the Logon Window ²	1 sec	1 sec

Action	64 MB Machine	32 MB Machine
Displaying the Notes Browser GUI after User ID and Password were entered. (This action loads Java.) ²	16 secs 13 secs ³	38 secs 17 secs ³
Opening a Message ³	2 secs	3 secs
Forwarding a Message using Forward ³	7 secs	12 secs
Replying to a Message using Reply with History ³	8 secs	16 secs
Replying to a Message using Reply ³	6 secs	9 secs
Selecting New Memo ³	3 secs	12 secs
Selecting All Documents folder ³	3 secs	6 secs
Open Calendar ³	3 secs	4 secs
Create New Appointment ³	3 secs	4 secs
Remarks: 1) Not loading a home page (empty page) 2) Loading the user's mail file (http://<Domino Server>/mail/<Domino User>.NSF) 3) -nojit option used in Netscape's Java properties		

Note

The performance numbers contained in Table 19 are believed to be sound, but IBM does not warrant or guarantee that you can or will achieve similar results on your system. It is your responsibility to validate the numbers and determine their relevance to your operation.

The OS/2 Domino server that was used for these tests was a 4-way 200 MHz SMP PC Server 704, installed with OS/2 Warp Server for e-business, 1 GB of RAM, and 200 MB of JFS I/O cache. The performance numbers reflect non-cached data, which means for each action shown in the table, the machine's Netscape disk cache was emptied, and the machine was rebooted. Therefore, if all applets remain in the system cache, the numbers are lower. All machines were attached to a 16 MBit/sec token-ring LAN.

The clients were installed with OS/2 Warp 4, FixPak 11, Java 1.1.8 plus Refresh, Netscape 4.61, and all client software updates that are delivered with OS/2 Warp Server for e-business, such as TCP/IP 4.21.

Notes Web browser loading times were taken using the HTML action bar (see Figure 42).



Figure 42. Action bar displayed in HTML

Loading the Applet action bar version instead (see Figure 43) costs less than a second for both 32 MB and 64 MB machines.



Figure 43. Action bar displayed using an applet

Chapter 6. Using the browser (WebMail) client

Introduced with Domino R5, the WebMail client can be used instead of a native Notes Client to do e-mailing and calendaring. If your database templates, such as your mail template, are based on R4 design, you may continue to use an R4 client. If you are unsure, please check with your Notes administrator.

This chapter illustrates the usage of the new Lotus Notes Web browser client, also known as the WebMail client. The following topics are discussed here:

- Enabling the WebMail client
 - Web browser features, considerations, limitations, and configurations
 - Action bar considerations (browser.cnf)
- Working with Mail, Calendar, To Do items, and the Domino Directory
- Changing the Notes WebMail client (Internet) password

6.1 Enabling the WebMail client

An OS/2 end user can access an OS/2 Domino R5 server in the following ways:

- From a supported Web browser
- From an existing Notes R4.x Client

As long as the R4 design of the user's mail box was preserved when the Domino server was upgraded, existing Notes R4.x Clients may continue to access their mail and calendar functions without interruption. However, if the new R5 mail file design was applied, Notes R4 Clients will be unable to display the framesets, outlines, pages, and other new features that the R5 mail template contains.

For new users registered from a Domino Administrator R5 for Windows, the mail box will automatically be based on the R5 mail template. This chapter focuses on new R5 users.

6.2 Web browser features

The following features shown in Table 20 are supported from a Web browser.

Table 20. Web browser features

Category	Features
General	Create and delete document folders.
	Copy and move documents to and from folders.
	Select multiple documents in folders and views.
	Delete documents.
	Work with private and public documents.
	Attach or detach up to two files to or from a document.
	Navigate to the next document without returning to the view.
	Change your password.
	Access the Domino Directory to address, for example, mail messages.
	Work with mail file folders to organize you mail messages.
	Read bookmark forms.

Category	Features
Mail	Read, compose, and send messages.
	Save drafts of messages that have not yet been sent to recipients.
	Send all types of replies (Reply, Reply to All, Reply with History, and Reply to All with History).
	Reply to messages with an offset character.
	Reply to and forward messages with attachments.
	Copy messages into new Calendar entries or To Do items.
	Add bold, italic, underlines, bullets, and color to text in messages.
	Select font sizes and types.
	Indent paragraphs and change text justification to left, center, or right.
	Create URL links within text.
	Create, edit, and delete rules to filter new messages.
	Receive delivery reports and return receipts.
	Resend messages that were addressed incorrectly.
	Link to address lists using customizable address book links.
	Read, compose, and send phone message forms.
	Perform integrated address lookup.
	Delegate mail access.

Category	Features
Calendar	Create appointments, reminders, events, anniversaries, and meeting invitations.
	Send information-only copies of meeting invitations to people. Reserve rooms and resources for meetings.
	Create repeating calendar entries.
	Perform free time searches.
	Reschedule, confirm, or cancel meetings.
	Remove invitees from meeting invitations.
	Review the status of invitee responses.
	Create broadcast meeting invitations.
	Learn about meeting updates automatically when viewing earlier messages about the meeting.
	Accept, decline, delegate, or tentatively accept meeting invitations.
	Propose rescheduling of meeting invitations.
	Categorize calendar entries.
	Remove meeting invitations from the Inbox automatically after responding.
	Suppress display of meeting invitation responses from Inbox.
	Hide or display calendar entries in All Documents view.
	Hide or display meeting invitations in Sent view.
	Set default repeating interval for anniversaries.
	Delegate calendar access.
To Do	Create and track To Do items.
	Assign To Do items to other people.
	Send information-only copies of To Do items to other people.
	Categorize To Do items and display To Do items by status or by category.
	Reschedule To Do items.
	Review responses to assigned To Do items.
	Reassign To Do items that have been declined by the original assignee.

Category	Features
	Accept, decline, or delegate assigned To Do items.

6.2.1 Web browser considerations

The list of Web browsers that are certified for use with a Domino R5 server are contained in the README.NSF file that ships with the Domino R5 product. As of the publication date of this book, a subset of the certified browsers are shown in Table 21.

Table 21. Certified Web browsers for Domino R5

Platform	Netscape Communicator	Notes Native Browser
OS/2 Warp Server V4	4.04 ¹	not available
Windows NT 4.0 (Intel)	4.5	R5
Windows NT 4.0 (Alpha)	not available	not available
Windows 95/98	4.5	R5
AIX 4.3.1	4.5	not available
Note: 1)Although Netscape 4.61 on OS/2 is not on the list of certified browsers, we urge you to use Netscape 4.61 anyway. Many problems that existed in 4.04, such as printing, are fixed in this release.		

Domino R5 supports JavaScript Version 1.3. Domino R5 server has licensed the Netscape JavaScript interpreter and Lotus has embedded it into the Designer and the client.

6.2.2 Web browser limitations

The following limitations exist for Web browser clients:

- Domino users who are accessing Mail, Calendar, and To Do lists from a Web browser must be using a system that supports a screen resolution of 800x600 (SVGA) or higher. Users of older machines with VGA (640x480) screen resolution will not see all the mail file items present in some secondary application windows.
- Web browser clients can use the Directory Catalog with the LDAP protocol. However, Web browser clients are unable to use the Directory Catalog database file directly. Attempts to open a document in the database results in an error message.
- The Web browser client is limited to two attachments.

- Not all Notes Rich Text features are supported by a Web client due to HTML font limitation. The supported styles are bold, italics, and underline.
- The Domino R5 release introduces several new list types including Checkmark, Alphabet, and Roman. These new list types are not available to Web clients.
- When changes are made to preferences or delegation profiles, the Web browser session should be closed in order to commit the changes.
- None of the To Do list advanced features (stationery, owner/participant actions, and copy into) are supported by Web browser clients.
- The Web browser client is only capable of opening a Calendar based on the R5 mail template.

6.2.3 Configuring Domino for OS/2 browsers

This section describes how to correctly configure the following browsers with the Domino Web Administrator:

- Netscape Communicator 4.04 for OS/2 Warp
- Netscape Communicator 4.61 for OS/2 Warp
- Netscape 4.5 for Microsoft Windows
- Netscape 4.6 for Microsoft Windows

The Domino server administrator must follow the ensuing subsections in order to enable configuration tasks through the browser client.

Important

For any release of Domino 5, you *must* make changes to the browser.cnf file so that OS/2 browsers are sent the action bar applet instead of the default action bar HTML. This change must be made to all Release 5 servers (OS/2, AIX, AS/400, S/390, Linux, HP/UX, Solaris, and Windows Notes servers) that will be serving OS/2 browsers.

6.2.3.1 Enabling the action bar

The default configuration of a Domino R5 server disables the action bar for OS/2 users. As a result, the HTML action bar is displayed as shown in Figure 44.

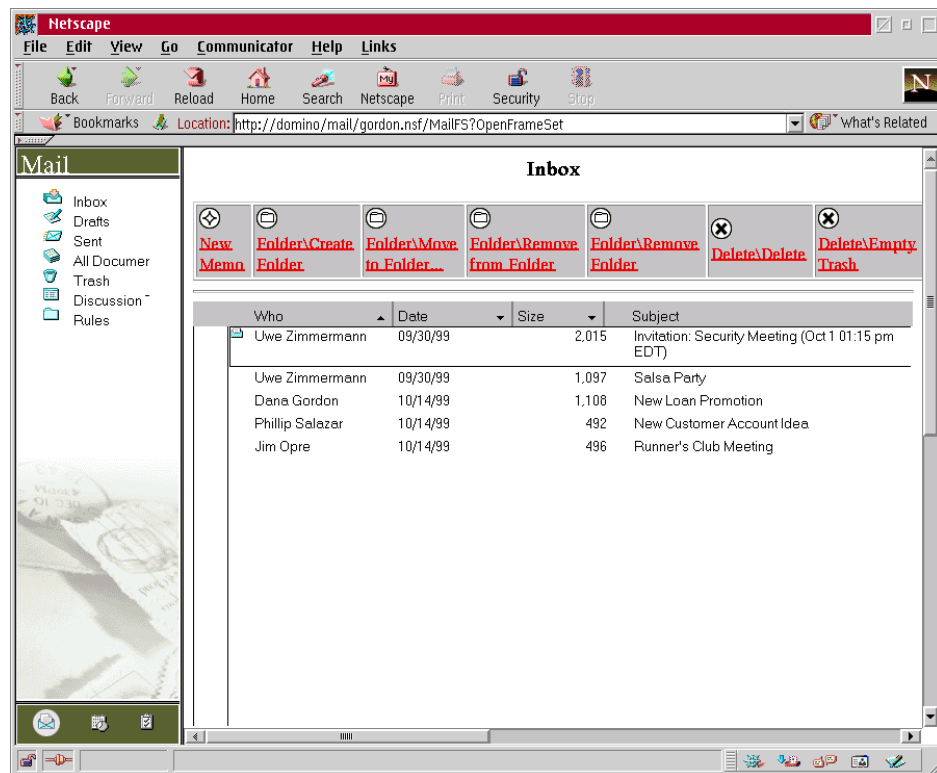


Figure 44. HTML version of the action bar

The applet action bar is shown Figure 45 on page 204.

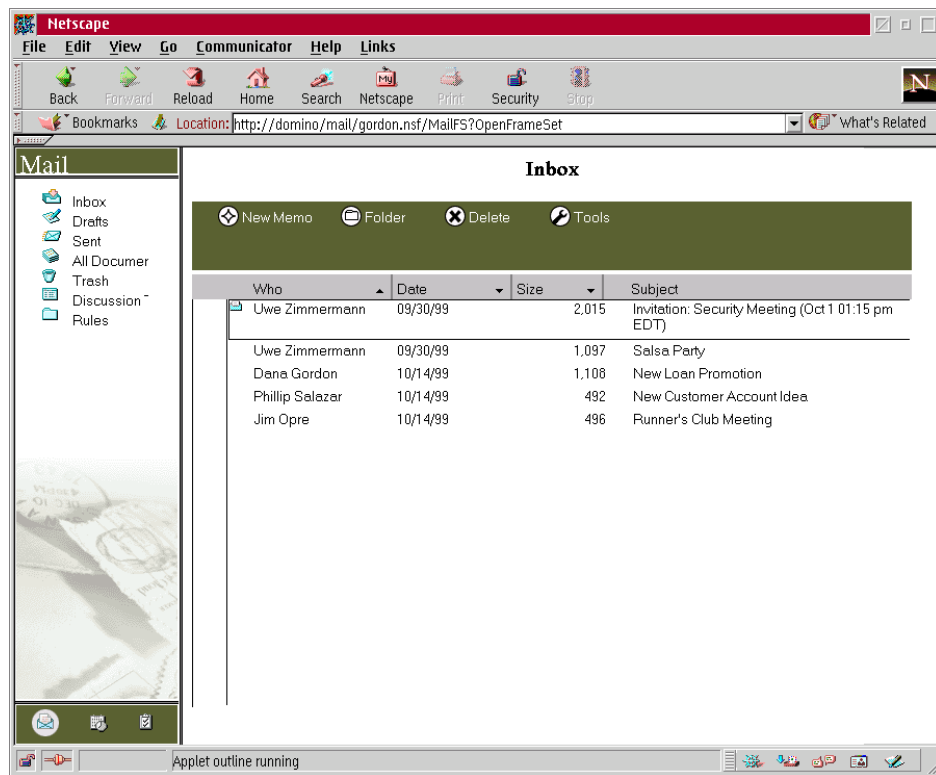


Figure 45. Applet-based action bar

However, to enable the applet action bar, the browser.cnf file must be modified. The file is located in the \DOMINO\DATA directory. Figure 46 on page 205 shows an excerpt of the required change.

```

## Platform - String that indicates the OS platform of the browser.
## Notes client: Unknown
Property Platform String Unknown
Rule Win95 Win95
Rule Win95 Windows 95
Rule Win98 Win98
Rule Win98 Windows 98
Rule WinNT WinNT
Rule WinNT Windows NT
Rule WinNT Windows\ -NT
Rule MacOS Macintosh
Rule MacOS Mac_PowerPC
Rule OS2 OS/2

```

Figure 46. BROWSER.CNF (Excerpt)

To enable the applet action bar, simply modify the last line from

```
Rule OS2 OS2
```

To:

```
Rule WinNT OS/2
```

After restarting the Domino HTTP server, the applet action bar should now be displayed as shown in Figure 45 on page 204.

Assuming Domino's HTTP server was already started, to restart the Domino's HTTP only, execute the following commands at the Domino server's console:

```
TELL HTTP QUIT
```

Wait for the message that shows that HTTP Web server is shutting down, then:

```
LOAD HTTP
```

6.2.3.2 User-Agent header

The Domino BROWSER.CNF file is used to determine the return value for @BrowserInfo formula based on the User-Agent header value provided by the browsers. Table 22 shows the User-Agent header value of some browsers in different platforms.

Table 22. User-Agent header

Browser and platform	User-Agent header
Netscape Communicator 4.04 on OS/2	Mozilla/4.04 [en] (OS/2; U)

Browser and platform	User-Agent header
Netscape Communicator 4.04 on OS/2	Mozilla/4.61 [en] (OS/2; I)
Netscape Communicator 4.5 on NT 4.0	Mozilla/4.5 [en] (WinNT; I)
Netscape Communicator 4.6 on NT 4.0	Mozilla/4.6 [en] (WinNT; U)

6.2.3.3 The WebAdmin_Disable_Force_GUI parameter

This notes.ini parameter specifies whether the Domino Web Administrator forces OS/2 browser users to use the Plain interface. The parameter syntax is:

WebAdmin_Disable_Force_GUI= <value>

Where value is either:

- 0 - OS/2 browser users must use the Plain interface (default).
- 1 - OS/2 browser users can use the Dropdown, Button, or Plain interface.

6.2.3.4 The WebAdmin_Expire_Cache parameter

This notes.ini parameter specifies whether the Netscape browser reloads the Web administrator from the cache or retrieves a new copy from the server. Reloading from the cache is faster, but in some instances, Netscape may not display changes, such as interface preference changes, to the Domino Web Administrator and resizing the browser window. The parameter syntax is:

WebAdmin_Expire_Cache=<value>

Where value is either:

- 0 - Reload the Web administration tool from cache (default).
- 1 - Reload the Web Administrator from the Domino server.

6.2.4 Netscape Communicator 4.04 for OS/2 Warp

Netscape Communicator 4.04 for OS/2 Warp is available from the following sources.:

- IBM Software Choice
<http://www.ibm.com/software/os/warp/swchoice>
- OS/2 Warp Server for e-business product package
- IBM Services
<http://ps.software.ibm.com>

To access the Domino R5 server from the Web browser, the JavaScript support must be activated on Netscape. To configure JavaScript support on this browser, select **Edit => Preferences => Advanced** and click the check box for **Enable JavaScript**.

Netscape 4.04 for OS/2 APAR IC23967 enables the action bar applet instead of an HTML action bar. This APAR fix is included in the Netscape 4.04 August 1999 refresh.

6.2.4.1 Printing

Printing in Netscape Communicator 4.04 is not as robust and full-function as in Netscape 4.61. Therefore, it is recommended that Netscape Communicator 4.61 be used instead.

6.2.5 Netscape Communicator 4.61 for OS/2 Warp

At the time of this writing, Netscape Communicator 4.61 for OS/2 Warp was available. While this is not yet a Domino-certified browser, the action bar problem is fixed in this release.

6.2.5.1 Printing

To print from Netscape 4.61 for OS/2, follow these steps:

1. Position the cursor inside the frame to be printed, then click mouse button 1. The Print icon is enabled on the Navigation tool bar once the frame has been selected. Please note that clicking on the applet does not select the frame.
2. Select **File => Print Frame...** or click the **Print** icon on the Navigation tool bar.

6.2.6 Other considerations

All applets except for the view applet are disabled when Internet Explorer 3 or 4 on the Macintosh is detected. That is, the HTML counterparts for these components are used. This is due to design limitations in the Java implementation for these browsers. For the view applet, we issue an error message rather than reverting to the HTML view since templates may have made use of applet-specific features that are not present in the HTML view.

6.3 Working with mail from a Web browser

In order access mail from the Web, the Domino server on which the mail file resides must be running the HTTP server task. If the Domino server is running the HTTP task, all that is needed is a Domino-compatible Web

browser installed and configured on the client machine and an Internet password. The Internet password is initially set by the Domino administrator.

6.3.1 Opening a mail file from a Web browser

When using a browser client, the mail database to be opened must be specified in the URL. To open a mail file using Netscape:

1. Open the Netscape browser.
2. Enter the URL to the Domino Mail Server and the name of the mail file that is to be opened. The URL syntax is:

```
http://<DominoServer>/<MailFolder>/<MailFile>.NSF
```

Where:

<DominoServer> is the host name or IP address of the mail server.

<MailFolder> is the name of the mail file subdirectory. By default, all the mail files are stored under the folder named mail.

<MailFile>.NSF is the actual mail database file name on the server.

3. Click the **Open** button to continue.
4. By default, the Access Control List (ACL) is restricted and no anonymous logins are allowed to a mail database. Therefore, you need to authenticate by entering your User Name and Internet Password as shown in Figure 47.

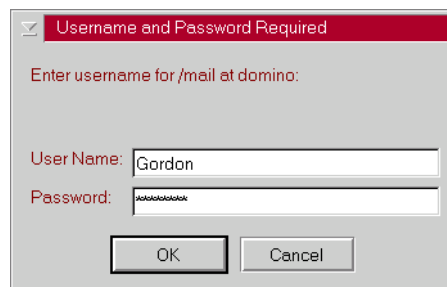


Figure 47. Netscape Logon window

The User Name can be any of the names defined in the User Name or Short Name fields in the Domino Directory. To learn how to find your user name in the Domino Directory, see 6.6, “Using the Domino Directory from the Web browser” on page 217.

The Password to be entered is the one defined in the Internet Password field of the Person document. Therefore, it can be different from the password used for the Notes Client. The initial password must be set by the administrator, but a user may change the password anytime later on.

For more information about changing the Internet password from a Web browser, see 6.7, “Changing the Internet password for a Web browser” on page 218.

Note

The administration can change the Domino server settings to allow less name variations with higher security unless the server is configured for higher security and fewer name variations.

5. Press the **OK** button to start the authentication process.

6.3.2 Navigating the mail database

After successful authentication, the main view of the mail file is displayed in the browser as shown in Figure 48.

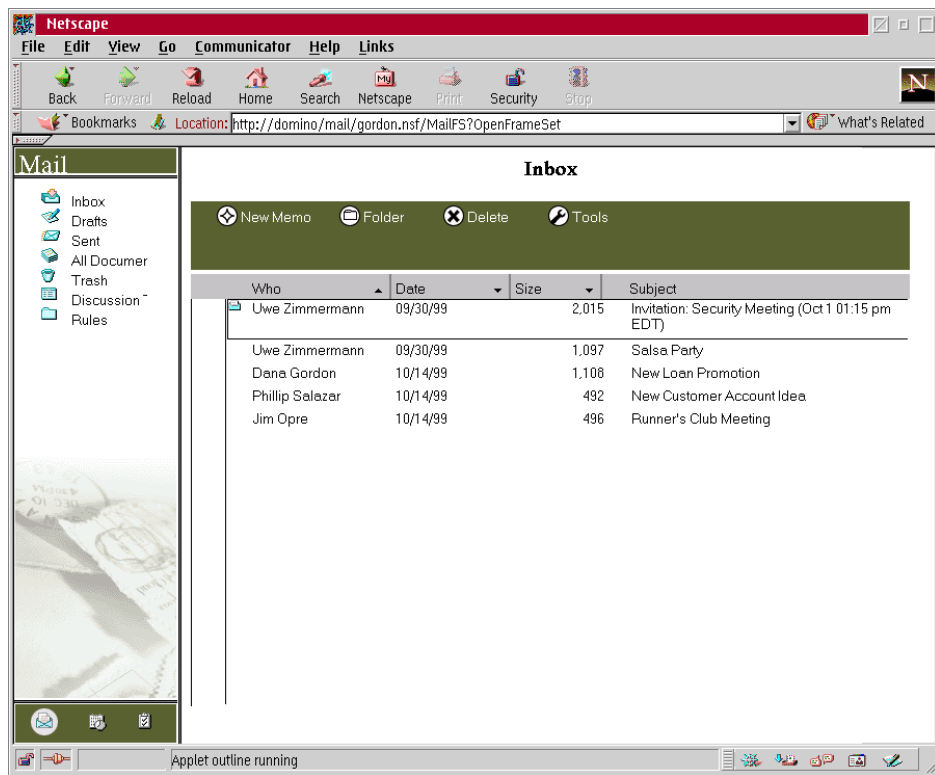


Figure 48. Default view of the mail database in the browser

The Web browser user interface is divided into three parts: the navigator on the left, the tool bar at the top, and the contents of the current view or document under the tool bar. You can change the view from the Inbox to the Calendar or To Do list by clicking the corresponding icon under the navigator as shown in Figure 49.



Figure 49. Icons representing Inbox, Calendar, and To Do tools

6.3.3 Composing a new mail message

To compose a new message, click the **New Memo** button and an empty memo form is displayed as shown in Figure 50.

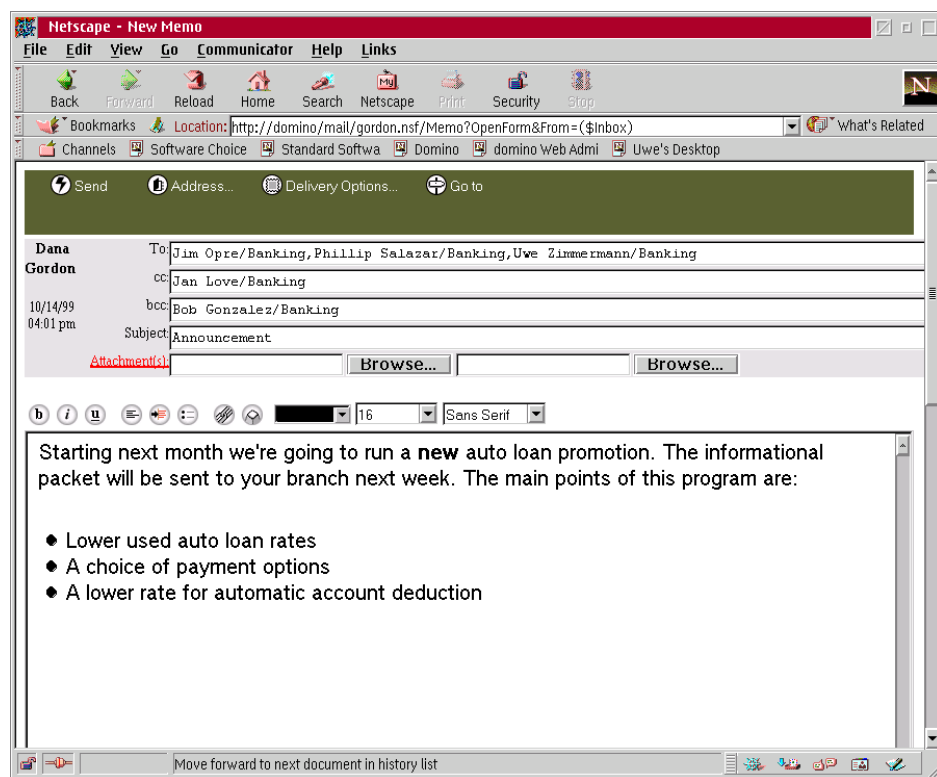


Figure 50. Composing a new message

To format the text, select an area and click the appropriate style bar button just above the message body. Text can be set to bold, italic, underlined, or any combination of these. You can also change the font style, color, and size.

The Web interface supports hyperlinks inside the message body. Simply highlight the text where the hyperlink should appear and click the action icon with the chain symbol in the style bar. Then enter the Web URL. Figure 51 shows the send options that the pull-down menu offers.



Figure 51. Send options

Hint

You can add a link to a Domino database by providing the database URL. For example, to add a link to the Notes/Domino help database, enter the following URL:

`http://<Domino Server>/help/help5_client.NSF`

6.3.4 Addressing messages

To make message addressing easier, a recipient can be selected by accessing the Domino Directory. To activate the name lookup, just click the **Address...** button in the tool bar, and the address book selection screen is displayed as shown in Figure 52 on page 212.

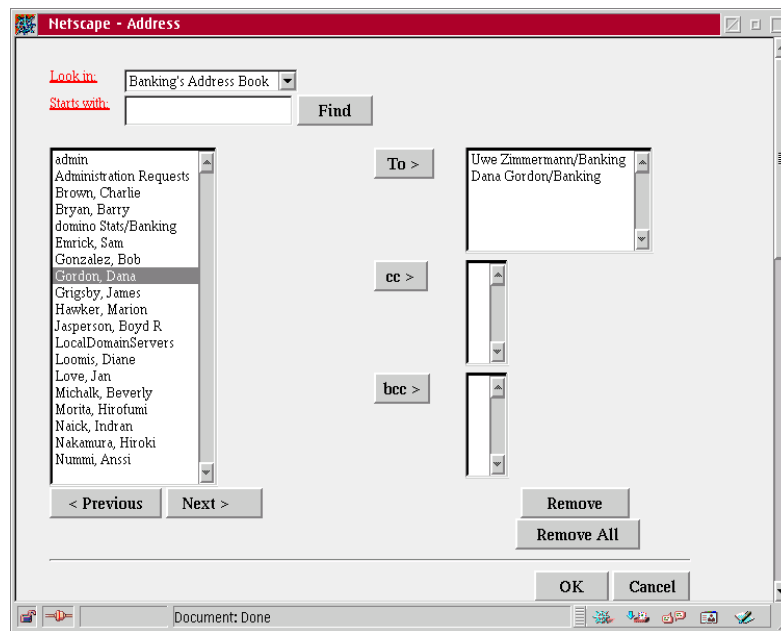


Figure 52. Using the Domino Directory for name lookups

Simply select the recipients from the directory and press the **To>** (addressed directly), **cc>** (courtesy copy), or **bcc>** (blind courtesy copy) button. Be aware that, if you press the **Next>** or **<Previous** button all previously selected recipients get unselected.

To exit the address book, press the **OK** button.

6.3.5 Working with existing messages

A message is opened from the Inbox by double-clicking on the message title. When the message displays, the following options are available:

- Write a new memo
- Forward the current memo
- Reply to the message
- Edit the memo
- Delete the memo
- Change the view
- Copy the current message into a new task or new calendar entry

6.3.6 Setting preferences

Calendar and mail preferences may also be set from the Web browser client. The Preferences button is listed in the action bar under the Tools button as shown in Figure 53.

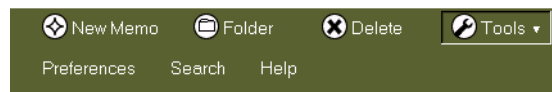


Figure 53. Tools preferences

After opening the Preferences page, Basic, Calendar, and Delegation preferences can be set. For example, personal free time information for meeting invitations can be set, as shown in Figure 54. A Delegation profile is very useful when for permitting others to manage your mail or to allow others to read or manage your calendar.

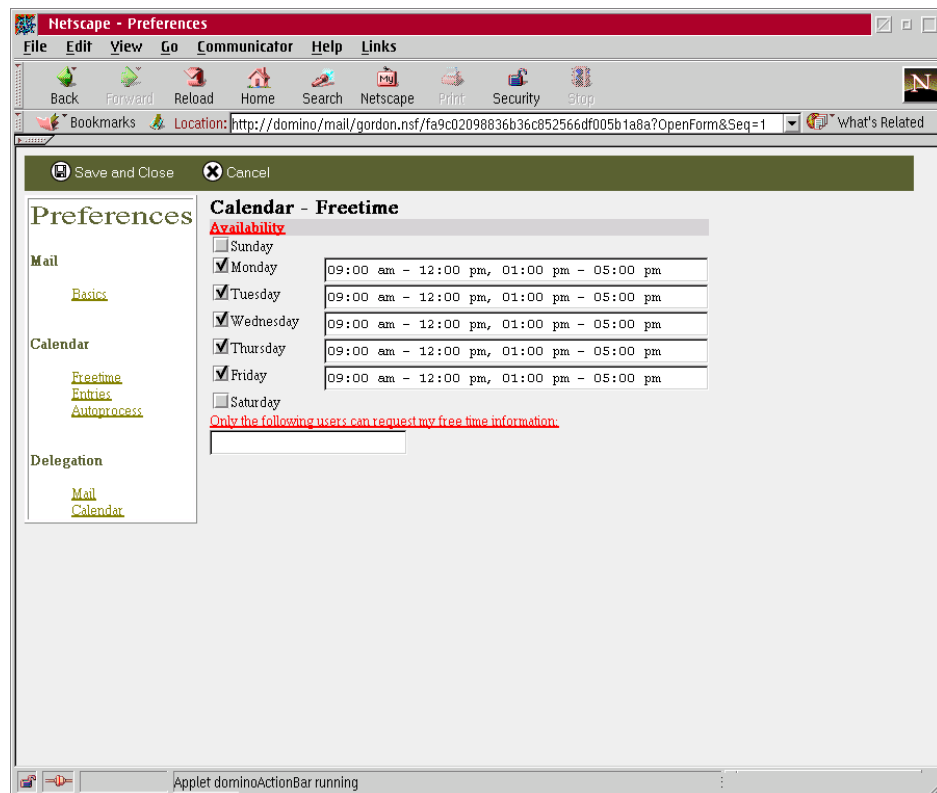


Figure 54. Setting preferences from the Web browser

Note

After changing preferences, close the browser session to the server to commit the configuration changes.

6.3.7 Refreshing the view

There is no automatic refreshing of the screen in the Web browser. If you change the view, for example, from Inbox to Calendar, the screen is being refreshed. If you want to refresh the screen manually, use the Web browser reload or refresh command.

6.3.8 Working with folders

Use the Folder action button to display the folder management functions. You can create new folders, move message(s) to another folder, remove messages from a folder, and remove folders.

Note

Be careful when removing messages or folders. There is no undo option available.

6.4 Working with the Calendar

From the main view, the Calendar view is opened by clicking the **Calendar** icon as shown in Figure 55.



Figure 55. Opening the Calendar

This opens the default Calendar view as shown in Figure 56 on page 215.

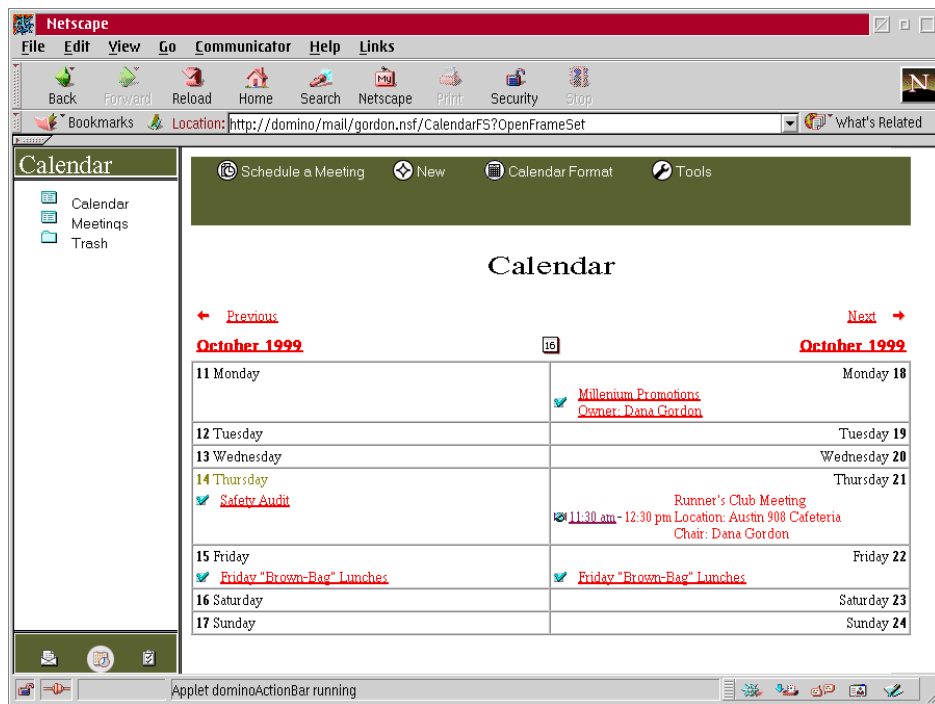


Figure 56. Default Calendar view

A Calendar entry is opened by clicking on the entry title. Once open, click the **Schedule a Meeting** button to create a meeting invitation or any other calendar entry. Select the **New** button to create any specific Calendar entry. You can change the Calendar format to display only one or two days, one week, two weeks or one month. From the tools menu, you can access the preferences and open Help.

Hint

You can use the Domino Directory to select meeting invitees and reserve rooms or other resources from a Web browser client as well. You can also check for free time information if the free time task is set to run on the Domino server. To access these features, create a new meeting and click the **Scheduler** button to display the functions.

6.5 Working with To Do items

From the main view, the To Do view of the mail database is opened by clicking the corresponding icon as shown in Figure 57.



Figure 57. Opening the To Do view

In the To Do view, you can manage all the To Do items, create new ones, delete existing entries, and use the Tools function to set preferences or to display Help as shown in Figure 58.

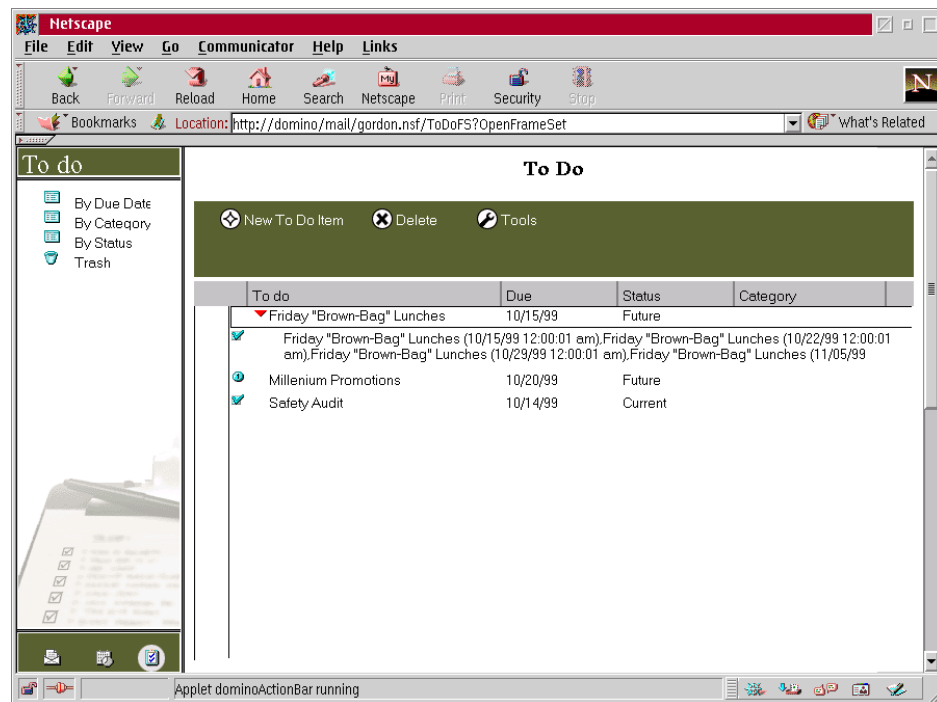


Figure 58. The To Do view

To create a new To Do item, press the **New To Do Item** button as shown in Figure 59 on page 217.

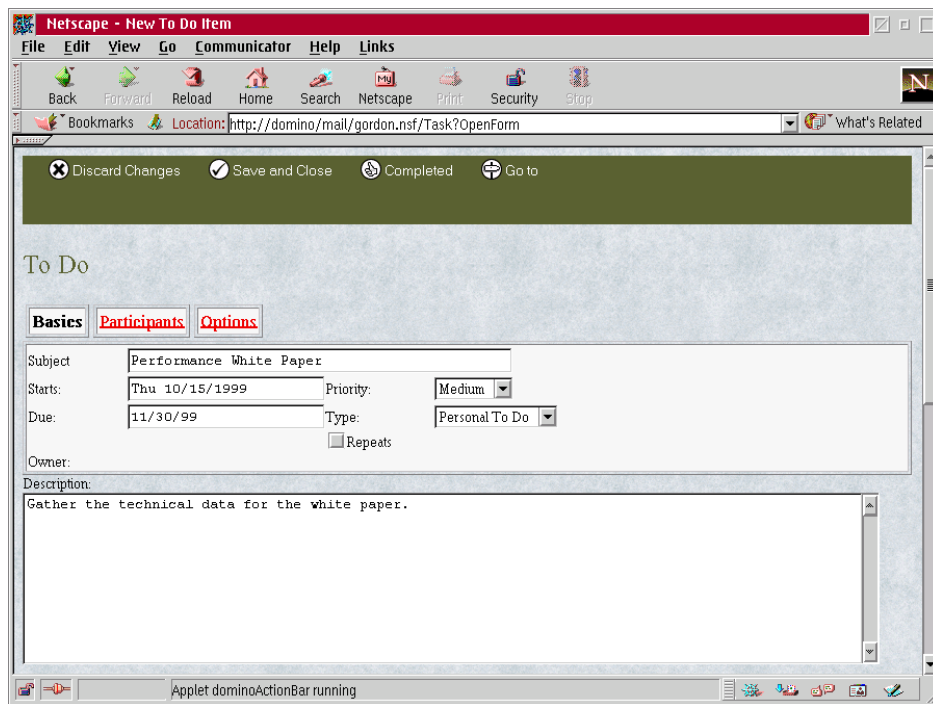


Figure 59. Creating a new To Do item

6.6 Using the Domino Directory from the Web browser

While a local copy of the Domino Directory (called Public Address Book in the previous release of Notes) cannot be made, it can be accessed using the Web client. To open the Domino Directory on the server, enter the following URL:

`http://<Domino Server>/names.NSF`

Where <Domino Server> is the host name or IP address. For example, if the server name is domino, the URL is:

`http://domino/names.NSF`

The Domino Directory is a public database. Therefore, by default, all users (including anonymous users) have access to it. As a result, by default, the Authentication window is not displayed prior to the database opening.

Note

Although you can view the Directory Catalog from a Web browser, you cannot open or work with documents or use Directory Catalog for mail addressing.

6.7 Changing the Internet password for a Web browser

Keeping the password secure is a very important issue in many environments. To change your Internet password, follow these steps:

1. Open the Domino Directory on your mail server from the Web browser by opening the URL:

`http://<Domino Server>/names.NSF`

Where <Domino Server> is your mail server. See Figure 60.

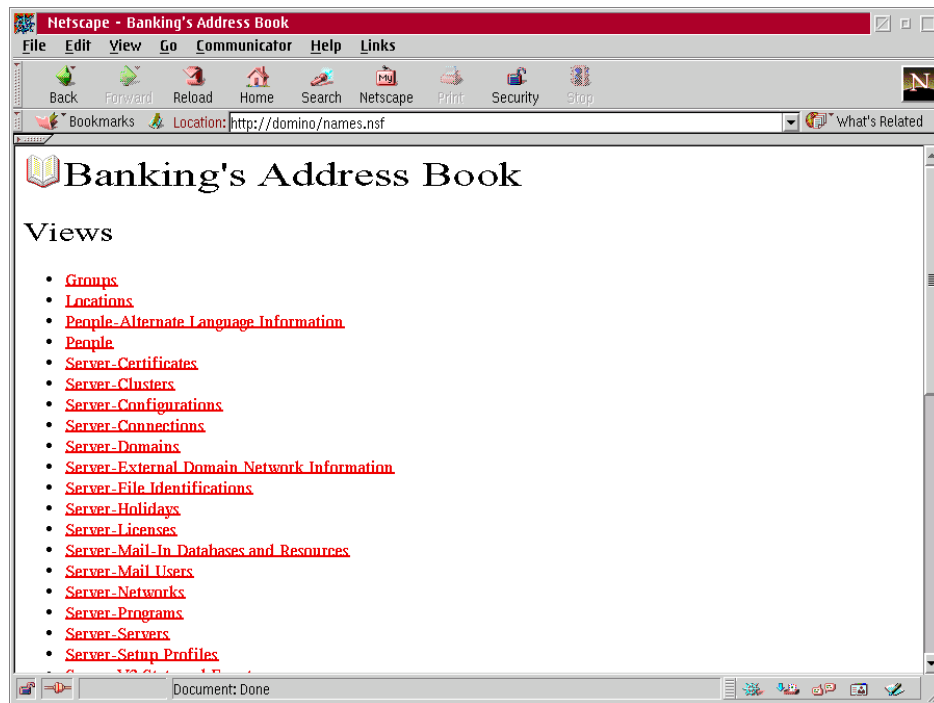


Figure 60. Address Book view

Depending on the Domino network configuration, it may be desirable to open the Domino Directory on the hub server instead. This causes the

password change to be distributed to other servers in the domain as soon as possible.

2. The Address Book view is displayed. Select the **People** view from the view list as shown in Figure 61.

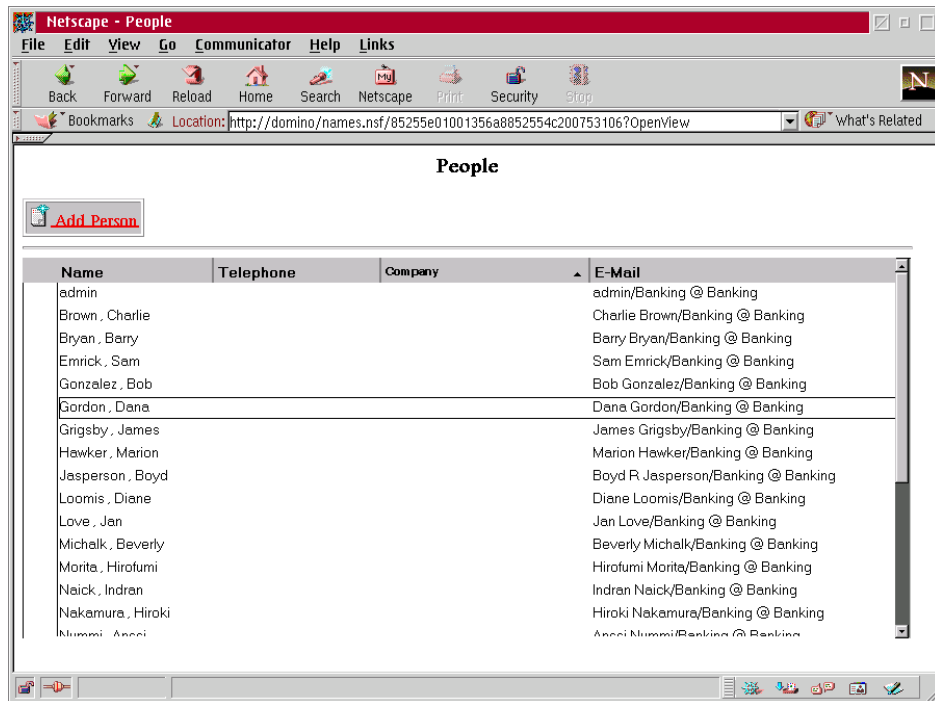


Figure 61. People view of the Address Book

3. All the people in the Directory are displayed. Locate your name in the list and double-click it to open the Person document as shown in Figure 62 on page 220.

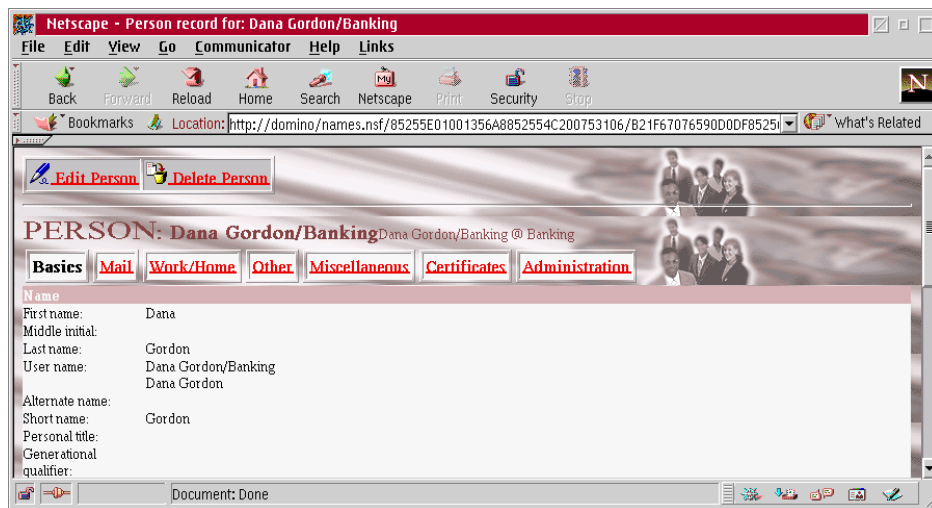


Figure 62. Person document

4. From the Person document, click the **Edit** button.
5. Locate the Internet password field on the page.
6. Type over the new Internet password as Figure 63 on page 221.

Note

The new password displays on the screen when you enter it. The password will be encrypted when you save the changes.

Also, remember to empty the disk and memory cache of the Web browser after setting the password. Otherwise, the next browser user may be able to display your Internet password from the browser cache.

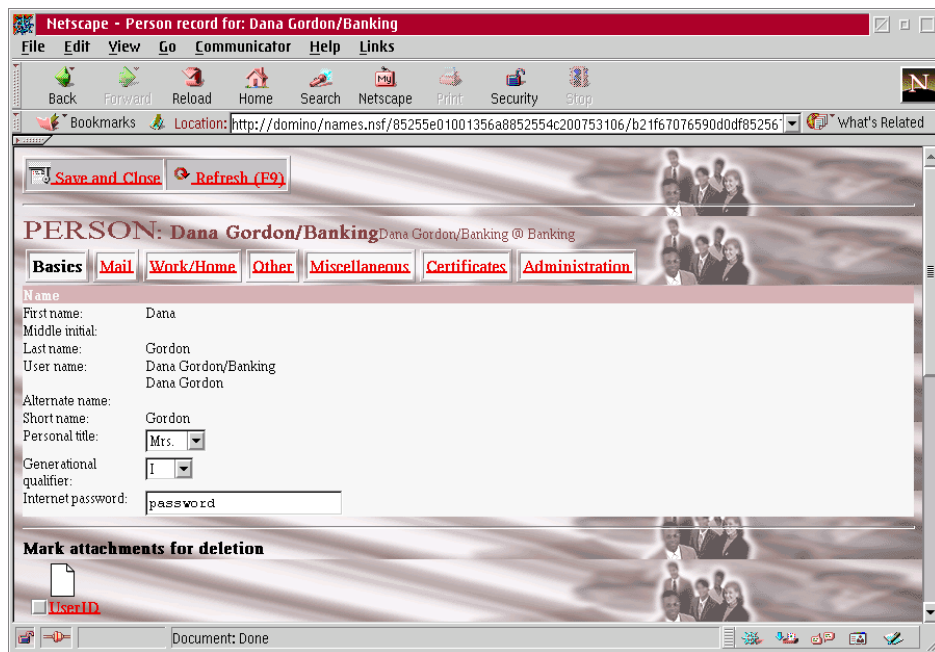


Figure 63. Changing the Internet password

7. Save the changes by clicking the **Save and Close** button.

Note

Depending on your Domino network configuration, it can take some time before the password change is propagated to other Domino servers in the Notes domain. The propagation time depends on the replication setup.

Chapter 7. Administering the OS/2 Domino R5 server: Part 1

This chapter and Chapter 8, “Administering the OS/2 Domino R5 server: Part 2” on page 253 illustrate the different methods for administering an OS/2 Domino R5 server. The following tools enable you to perform administration tasks against an OS/2 Domino R5 server:

- Domino Administrator R5 for Windows

This client, which ships with the Windows Domino software package, offers the most complete set of features for managing an OS/2 Domino R5 server in a single tool.

- Notes R4 for OS/2 Client

At the time of this writing, the latest OS/2 Notes release available is 4.57a.

- Domino Web Administrator

This method of administration uses the browser interface of Lotus Notes.

- Tivoli Manager for Domino V1.4.2

For basic server administration, the Notes R4 for OS/2 client, the Domino Web Administrator, the Tivoli Manager for Domino V1.4.2, or combination of all tools, will suffice. However, a Domino Administrator R5 for Windows is required to register new R5 users and to manage certain new Domino product features, such as LDAP.

This chapter addresses the Domino Administrator R5 for Windows and using existing OS/2 Notes Clients. Chapter 8 provides an overview of the Domino Web Administrator and the Tivoli Manager for Domino module, which operates in either the Tivoli Framework or Tivoli IT Director environment. With this administration module, Domino can be integrated into the system management environment.

7.1 Retrieving the administrator ID file

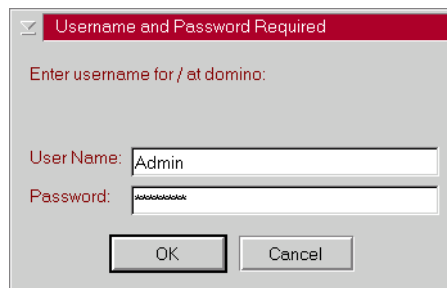
After the installation of the OS/2 Domino R5 server, the administrator ID file must be detached from the Domino Directory. To retrieve the ID file, follow these instructions:

1. Open a supported Web browser, such as Netscape 4.61.
2. Enter the following URL:

`http://<Domino Server>/webadmin.nsf`

Where <Domino Server> is the hostname or IP address of the first server in the Notes domain.

3. At the Logon window, as shown in Figure 64, enter the User Name and Internet Password.



A Netscape dialog box titled "Username and Password Required". It contains the text "Enter username for / at domino:". Below this, there are two input fields: "User Name:" with the text "Admin" entered, and "Password:" with masked characters "*****". At the bottom are "OK" and "Cancel" buttons.

Figure 64. Web Admin: Netscape Logon window

After successful authentication, the default Domino Web Administrator view is displayed as shown in Figure 65.

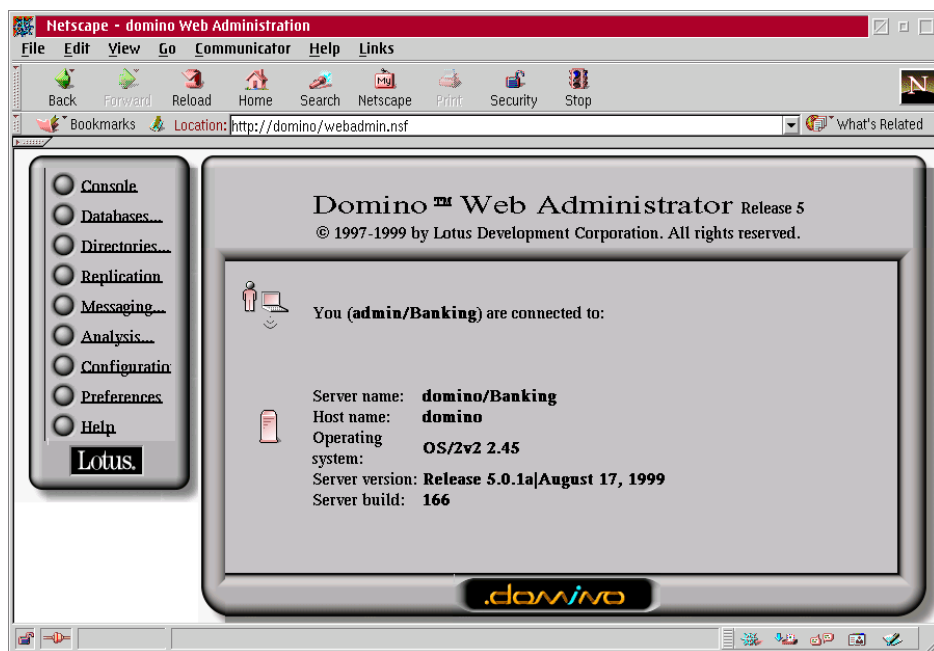


Figure 65. Web Admin: Default Domino Web Administrator view

4. Click **Directories** button.

5. Click on **People** button.
6. Double-click on the user that represents the administrator as shown in Figure 66.

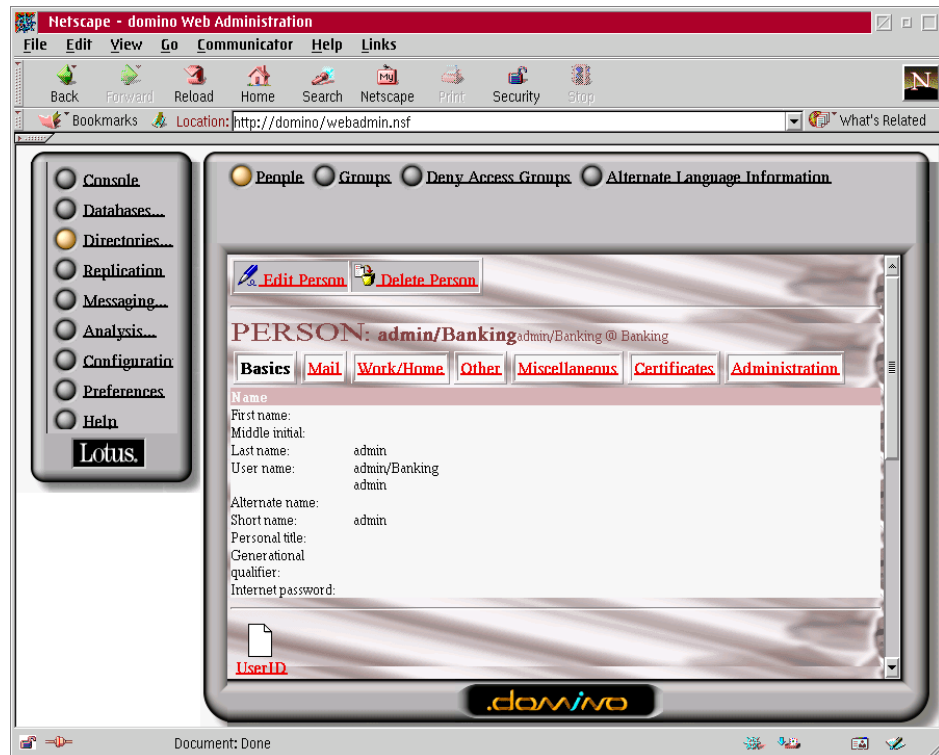


Figure 66. Web Admin: Retrieving the administrator ID

7. Click on the **UserID** file on the bottom left corner of the screen.
8. Click **Save File...** which displays an Unknown File Type window as shown in Figure 67.

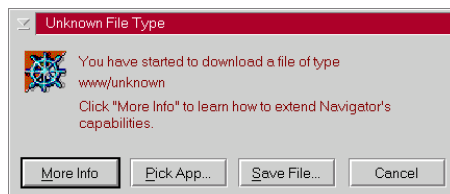


Figure 67. Web Admin: Netscape Unknown File Type window

9. At the Save As window, change UserID.html to admin.id, or another file name with an .id file extension, and select the drive and directory where you want to save the file to.

For example, if you intend to install the Windows Administrator Client on that same machine, save the ID file to local drive. You need to provide this .ID file during first invocation of the Administrator Client. Otherwise, save the .ID file on a networked drive.

10. Press **OK**.

This admin.id file is required to configure either the Domino Administrator for Windows or the OS/2 Notes Client.

7.2 Installing and configuring the Domino Administrator for Windows

The Lotus Domino Administrator is one of the three Notes Client components shipped in the Windows Domino software package. During installation, the following options are available:

- Install all clients
- Install the Notes Clients
- Install the Domino Administrator
- Install the Domino Designer

Either choose to install all the clients or just the Domino Administrator. A full install of all clients requires approximately 150 MB of free hard disk space and a minimum of 32 MB of RAM.

7.2.1 Saving key files

As with any other software upgrade, it is recommended that key files be saved before running the upgrade process. The key Notes Client files are listed in Table 23.

Additionally, the existing notes.ini file should be copied from the Windows directory (c:\winnt) into the Notes data directory (c:\notes\data).

Table 23. Saving key Notes files

File	Default Location
Notes Configuration (notes.ini)	Windows Directory (c:\winnt)
Desktop Configuration (desktop.dsk)	Notes Data Directory (c:\notes\data)
Personal Address Book (names.nsf)	Notes Data Directory (c:\notes\data)

File	Default Location
User ID Files (*.id)	Notes Data Directory (c:\notes\data)
Local Databases (*.nsf)	Notes Data Directory (c:\notes\data)
Local Templates (*.ntf)	Notes Data Directory (c:\notes\data)
Local Database Directory Links (*.dir)	Notes Data Directory (c:\notes\data)

7.2.2 Installation steps

To perform the installation of the client software, follow these steps:

1. Select **Start => Run** from the Start menu.
2. Type `x:\<Path>\SETUP.EXE` in the dialog box and then press **Enter**.
3. `x:` is the CD-ROM drive letter and `Path` is the appropriate product directory.
4. Click the **Next >** button.
5. Click the **Yes** button to accept the license agreement.
6. Either confirm the Name and Company details, or change the information as required as shown in Figure 68.

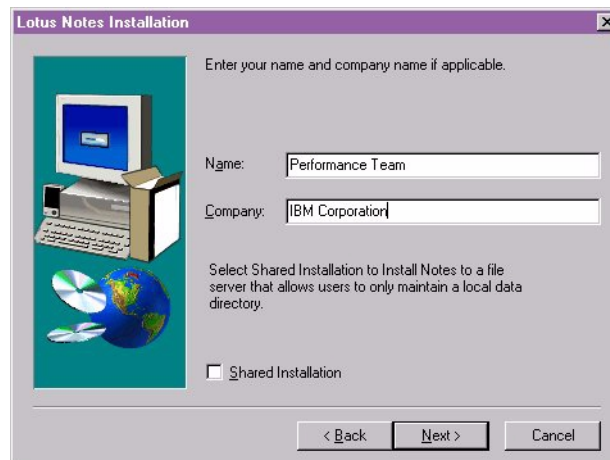


Figure 68. Notes install: User information confirmation window

7. Because this is a local install on a workstation, not a shared file server, make sure that the Shared Installation option is not selected and click **Next >**.

8. Set the Notes program and data directories. To change the default directories, click the corresponding **Browse...** button and choose another directory as shown in Figure 69.

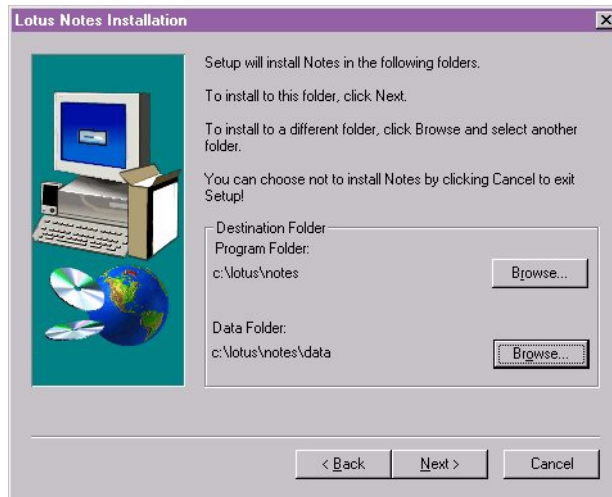


Figure 69. Notes install: Choosing client program and data directories

Select **Next >** to confirm the installation folders.

9. Either select **All Clients** or **Domino Administrator** as shown in Figure 70 on page 229.

Note

Later in this chapter, it is assumed that the Notes Client was installed.

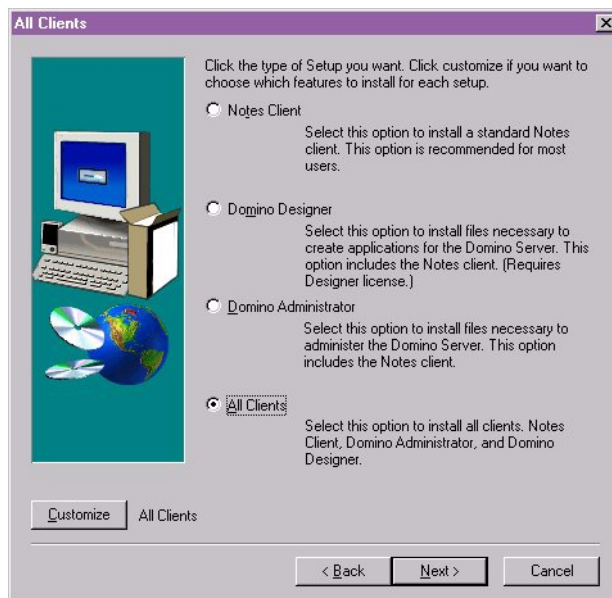


Figure 70. Notes install: Choosing the client installation type

10. To customize the installation options, click the **Customize** button.
Depending on the clients chosen to be installed, certain components may be customized. A description of the install options and their sub-components is shown in Table 24.

Table 24. Client installation components

Component Name	Available Sub-Components
Administration Client	None
Common Data	Optional Data Files Domino Admin Optional Templates
Designer Client	None
DECS	DECS
Domino Designer	Domino Designer Data
Help	Administration Guided Tour Designer Guided Tour Administration Help Client Help Designer Help Client Guided Tour

Component Name	Available Sub-Components
Migration Tools	cc:Mail Client Migration Tools cc:Mail Admin Migration Tools Calendar Client Migration Tools Eudora Client Migration Tools Organizer Migration Groupwise 4 Admin Migration Groupwise 4 Client Migration Groupwise 5 Admin Migration Groupwise 5 Client Migration Netscape Admin Migration Netscape Client Migration Exchange Admin Migration Exchange Client Migration MS Mail Admin Migration MS Mail Client Migration LDIF Admin Migration NT Admin Migration
Notes Data Files	Required Data Files Modem Command Scripts Icons Readme
Notes Minder	None
Notes Program Files	Extended Viewers Required Program Files Java Support Network Drivers JIT Debugger Import Export Engine Client Mail MS Office Main Integration Windows System Files
NT Client Single Logon	Uninstaller System Files
Shared Install	None
Spell Check	International Directories Chinese Spell Checker English Dictionaries

11.Click **Next** > to continue.

12. Select an existing folder for Notes Client icons or enter the name for a new folder as shown in Figure 71.

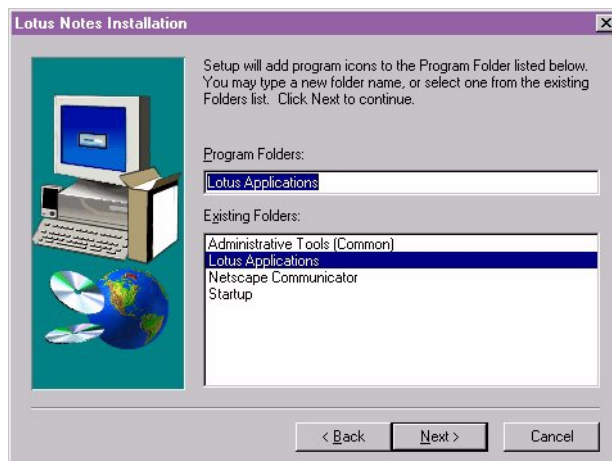


Figure 71. Notes install: Choosing a folder for Lotus Domino applications

13. Click **Next >** to start the file copy process. Once the copy process has finished you have the option to register. To skip that and press **Exit**, then select **Yes** at the confirmation window. Finally, click **Finish** to complete the installation.

7.2.3 Configuration steps

Once the installation has successfully completed, proceed with the following configuration steps.

1. Select **Start => Programs => Lotus Applications => Lotus Domino Administrator**. The Lotus Notes Client Configuration window is presented as shown in Figure 72 on page 232.

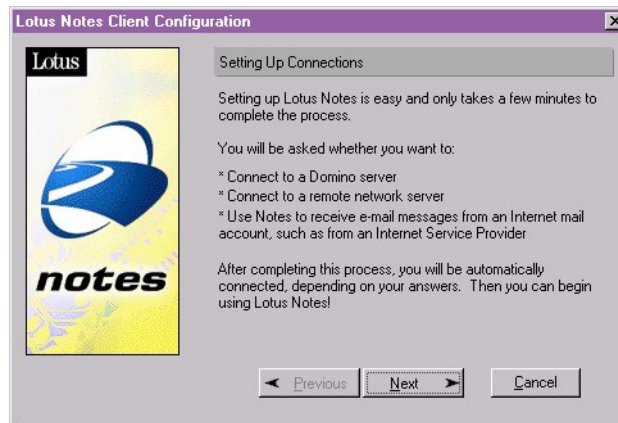


Figure 72. Domino Administrator: Lotus Notes Client Configuration window

2. Click the **Next >** button.
3. At the next window, the radio button defaults to I want to connect to a Domino server. Click on the **Next >** button to continue as shown in Figure 73.

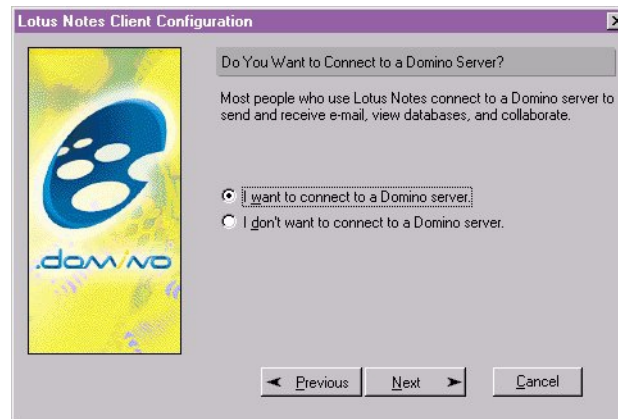


Figure 73. Domino Administrator: Connect to a Domino server

4. At the next window, the radio button defaults to Set up connection to a local area network (LAN). Click on the **Next >** button to continue as shown in Figure 74 on page 233.

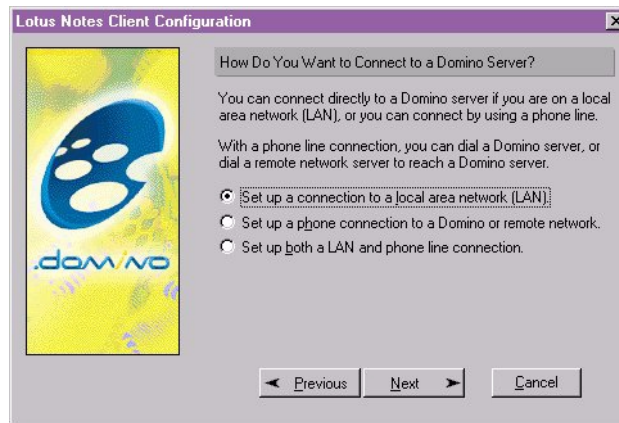


Figure 74. Domino Administrator: Specifying the connection

5. At the next window (Figure 75), enter the fully qualified Domino server name, whose administrator ID was retrieved in 7.1, “Retrieving the administrator ID file” on page 223.

Note

The Domino server needs to be running in order to proceed.

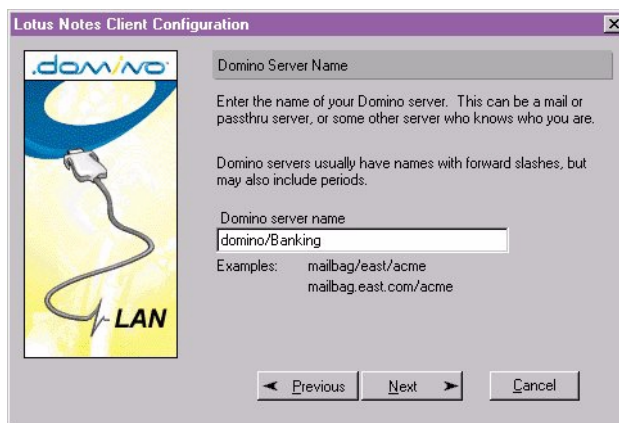


Figure 75. Domino Administrator: Specifying the Domino server name

Press **Next >** to continue.

6. At the next window shown in Figure 76, specify the administrator ID file you saved in Figure 67 on page 225.

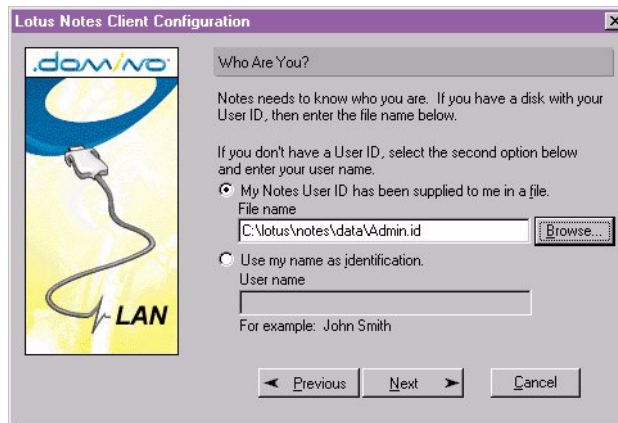


Figure 76. Domino Administrator: Specifying the administrator ID location

Press **Next >** to continue.

7. The next window prompts you to enter the administrator ID password. This password was set when the Domino server was configured as discussed in 3.2, "Configuring Domino R5" on page 62. Click **OK**.
8. To connect to your Domino server, click **Next >** as shown in Figure 77.

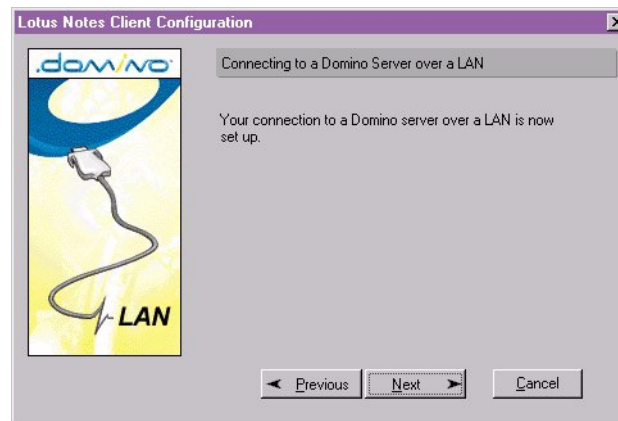


Figure 77. Domino Administrator: Connecting to a Domino Server

A series of four windows follows. Accept these default values:

1. Do not create an Internet mail account.
2. Do not connect to a news server.
3. Do not connect to a directory server

4. I do connect to the Internet through a Proxy server.
9. If you connect to the Internet through a Proxy server, enter your Proxy configuration information as shown in Figure 78. In our example it is: socks.server.banking.net.

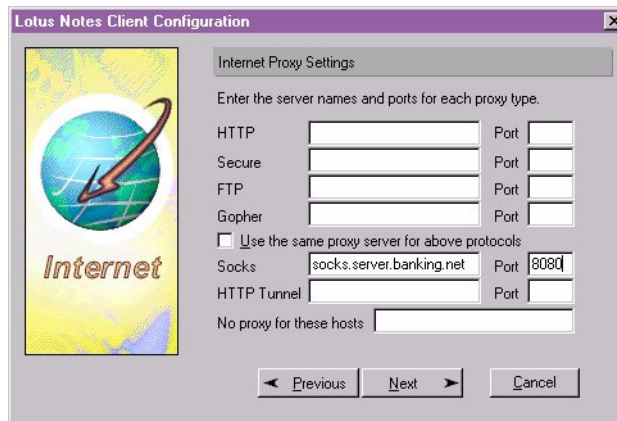


Figure 78. Domino Administrator: Specifying Internet Proxy Settings

Click **Next >** to continue.

10. Chose the default setting for How do you want to connect to the Internet, and click **Next >** to continue as shown in Figure 79.

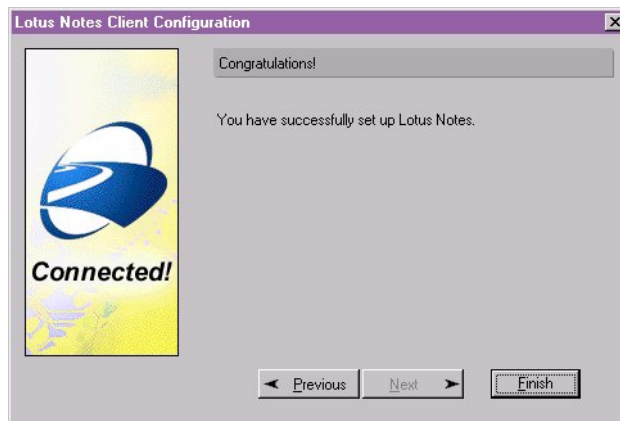


Figure 79. Domino Administrator: Congratulations screen

11. Click **Finish**.
12. This creates several databases including the user's address book. When the Notes Setup is Complete window appears, click **OK** to proceed.

Eventually, the Welcome to the Domino Administrator screen appears as shown in Figure 80.

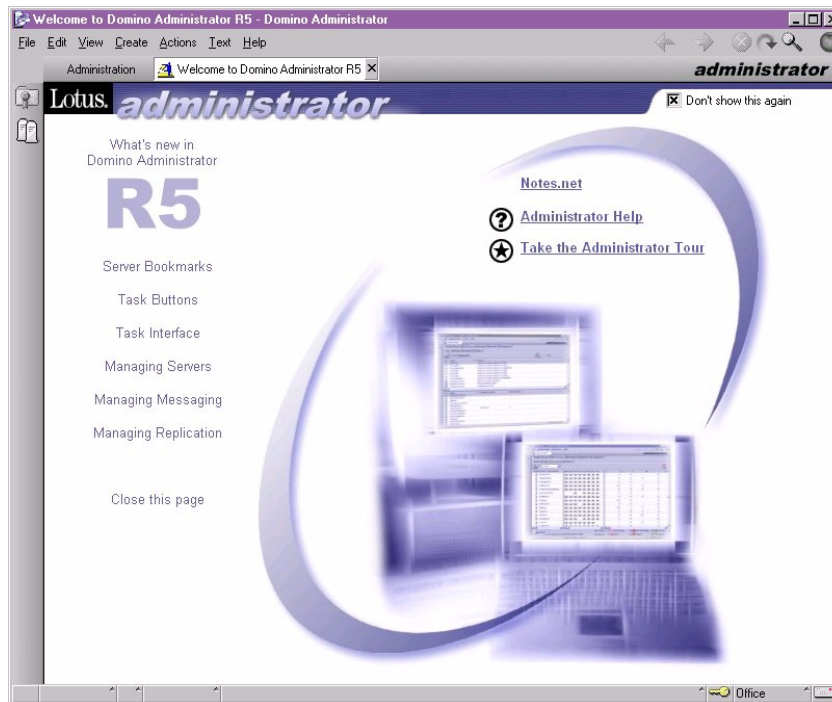


Figure 80. Domino Administrator: Welcome screen

13. Be sure to check the Don't show this again box in the upper right hand portion of the screen. Then press **Esc**. The default Domino Administrator screen is displayed as shown in Figure 81 on page 237.

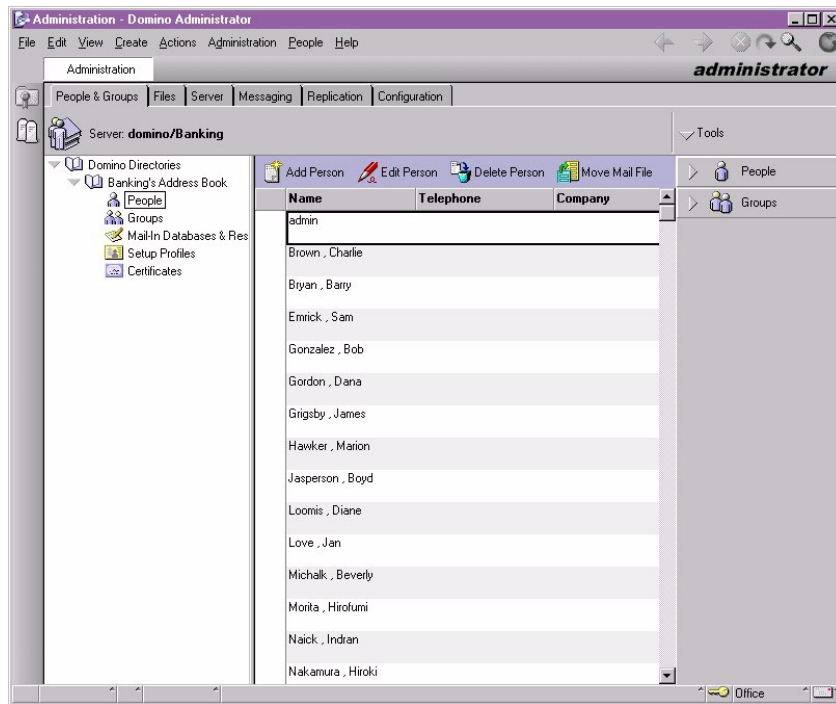


Figure 81. Domino Administrator: Default Administrator window

7.3 Using Domino Administrator for Windows

A Domino Administrator for Windows is required in order to manage certain R5 features, including:

- Registering new R5 users.

Note

If you only intend to create R4 users, the OS/2 Notes R4 Client will suffice.

- Creating User Setup Profiles.
- Requiring SLL connection to a database.

For more information on using the Domino Administrator, refer to the online help system and product publications that ship with the Domino R5 server.

Additionally, the Domino Administrator for Windows may be used to manage both R5 and R4 servers. However, not all of the R5 features apply to an R4 server.

Figure 82 illustrates the Domino Administrator interface.

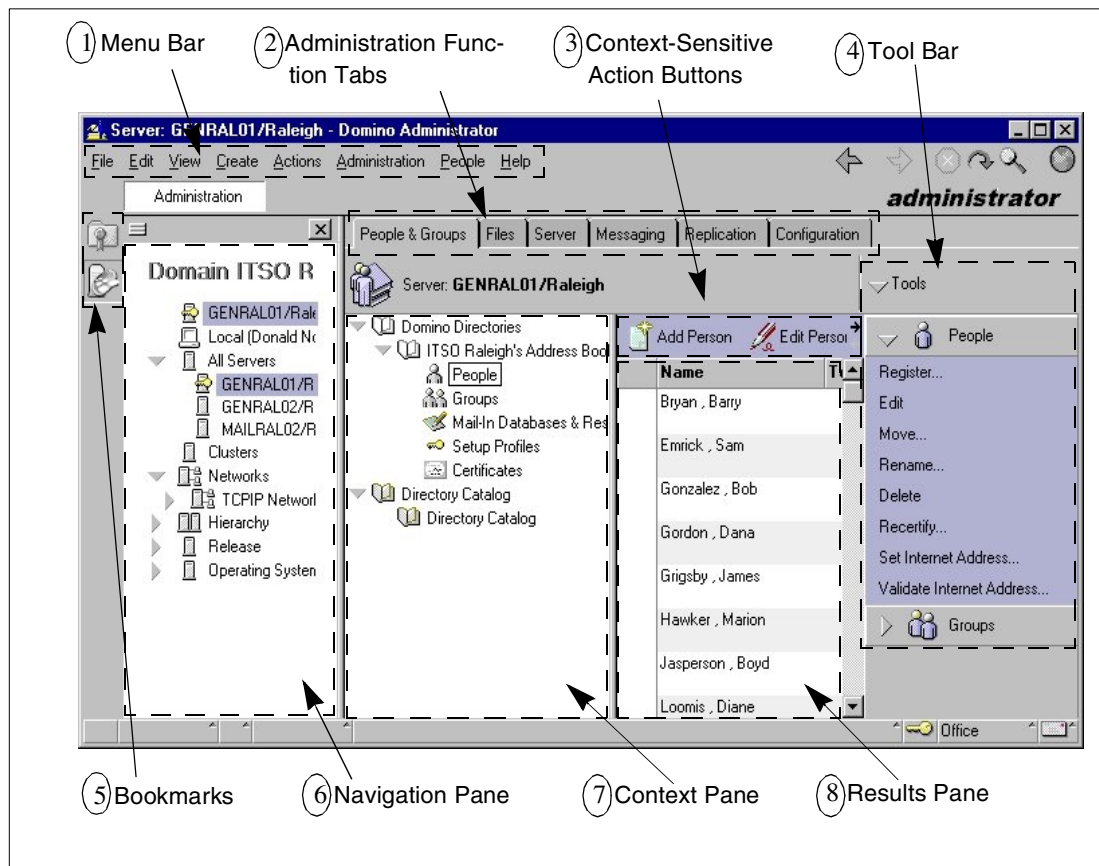


Figure 82. Domino Administrator: Domino Administrator interface

The menu bar (1 in Figure 82) is context-sensitive. This is easily seen by selecting different Administration Function tabs (2). As the view changes, the menu bar displays only those menus and menu actions that are valid for the selected object.

The action buttons (3 in Figure 82) provide easy access to the most common administration tasks for selected objects. You can also use the Tool bar (4) or the right mouse button to perform common administration tasks.

Bookmarks (5 in Figure 82) allow quick and easy access to your favorite Domino servers and other objects.

The navigation pane (6 in Figure 82 on page 238) allows navigation of the Domino domain structure, while the context pane (7) displays a hierarchical view of the object you are currently working on. Finally, the results pane (8) displays the result set of the chosen context.

7.3.1 Setting Administration Preferences

To simplify managing Domino servers, Administration Preferences may be set. These are in addition to the standard User Preferences. Administration Preferences are accessed through the menu bar by selecting **File => Preferences => Administration Preferences**.

The Basics button defines which Domino domains are to be administered from the client. The Files button defines which columns to display in the Files view of the selected Domino server. The Monitoring button provides the options to set, for example, how much memory is reserved on the client for monitoring and whether the information is gathered on a server or on a client. The last set of options are found in the Registration button. See Figure 83.

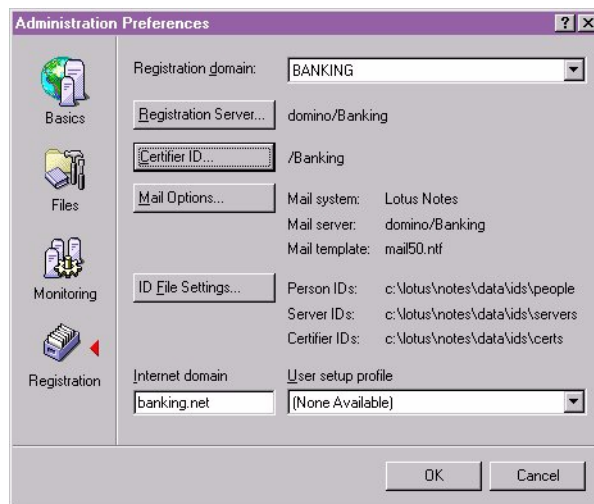


Figure 83. Domino Administrator: Administration Preferences window

These settings allow you to specify a default registration server and certifier ID, several mail options, and the locations for ID files for users and servers. Different settings may be defined for each domain configured in the Basics view, allowing simple access across multiple domain networks.

7.3.2 The People & Groups view

The People & Groups view, shown in Figure 84, is displayed by default when the Domino Administrator is opened. From here, the following tasks can be performed:

- Create new users and groups.
- Rename users. Relocate users to another organizational unit.
- Set the user's Internet addresses.
- Manage groups.
- Display the Directory Catalog.

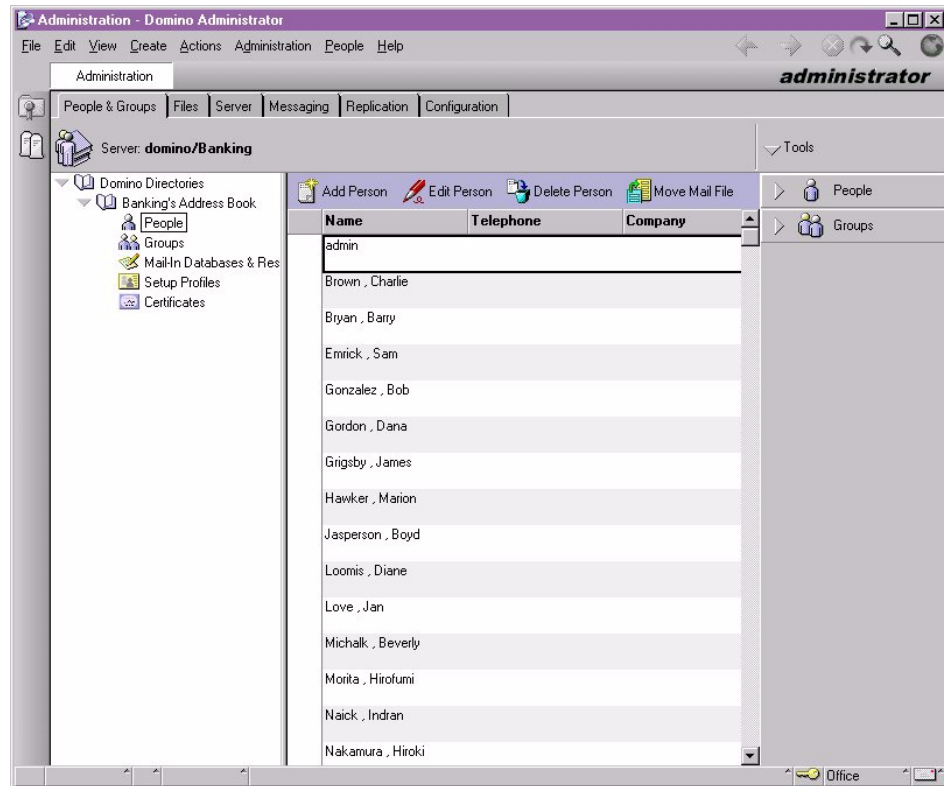


Figure 84. Domino Administrator: People & Groups view

7.3.3 Creating User Setup Profiles

Domino R5 provides you with excellent support for automating your users' desktop and bookmark creation and maintenance. This feature is called Setup Profiles.

A Setup Profile is a configuration document that is assigned to a user. The same Setup Profile can be assigned to several users and a user may have more than one profile assigned to them. The Setup Profile document can define, for example, the Internet browser, Directory server, Catalog/Domain Search servers, databases to be added to the user's bookmarks, databases to be created as new replicas on the user's machine, mobile directory catalog databases, dial-up settings, Internet server accounts, and network proxies.

If changes are made to settings in an existing Setup Profile, users receive the new definitions the next time they connect to their home server. Therefore, maintenance is simple and flexible. Setup Profiles are Domino domain wide.

To create a Setup Profile, follow the instructions given below:

1. From the Domino Administrator default view, open the Administration server.
2. Select the **People & Groups** tab.
3. Open the **Setup Profiles** view under Domino Directories. The view is shown in Figure 85.

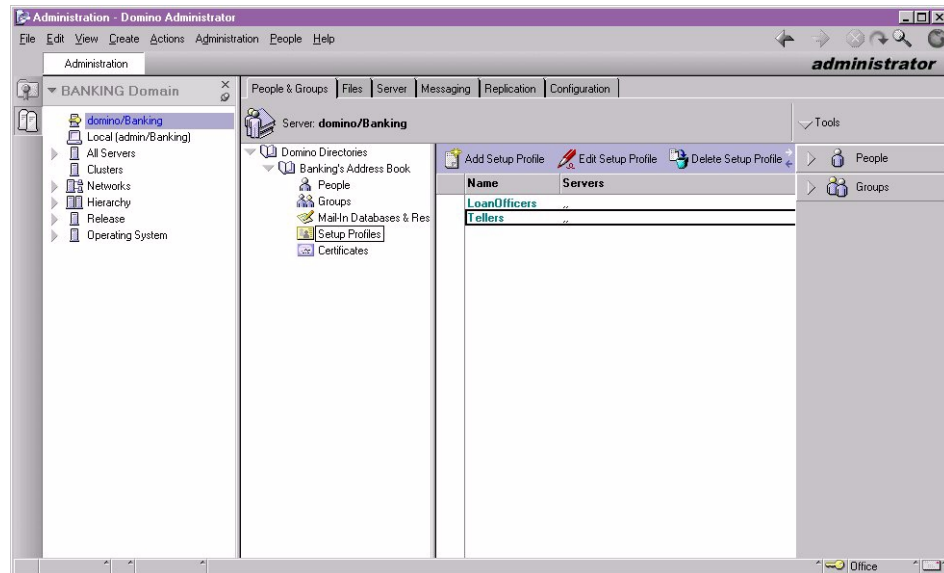


Figure 85. Domino Administrator: Setup Profiles view

4. Select the **Add Setup Profile** button to create a new profile.
5. Enter the Profile name and fill in the other information on the Basics tab as shown in Figure 86 on page 242.

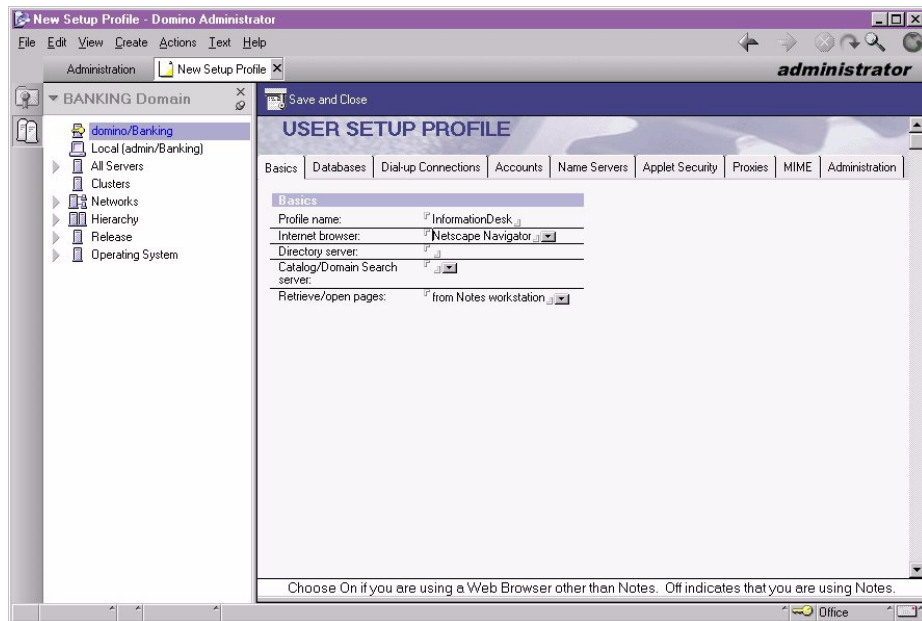


Figure 86. Domino Administrator: Setup profile name

6. Select the **Databases** tab.
7. Go to the Lotus Notes Client.
8. Open the database you want to define for the profile.
9. Select **Edit => Copy As Link => Database Link** to copy the database as a link.
10. Go back to the Setup Profile document.
11. Click in the Default databases added to bookmarks field.
12. Select **Edit => Paste** to add the database link in the Setup Profile document as shown in Figure 87 on page 243.
13. Repeat steps 7 through 12 for each database that is to be added to a user's bookmarks and also for the local replicas field. A sample profile is shown in Figure 87 on page 243. In practice, it is likely that more databases will be added in these fields.

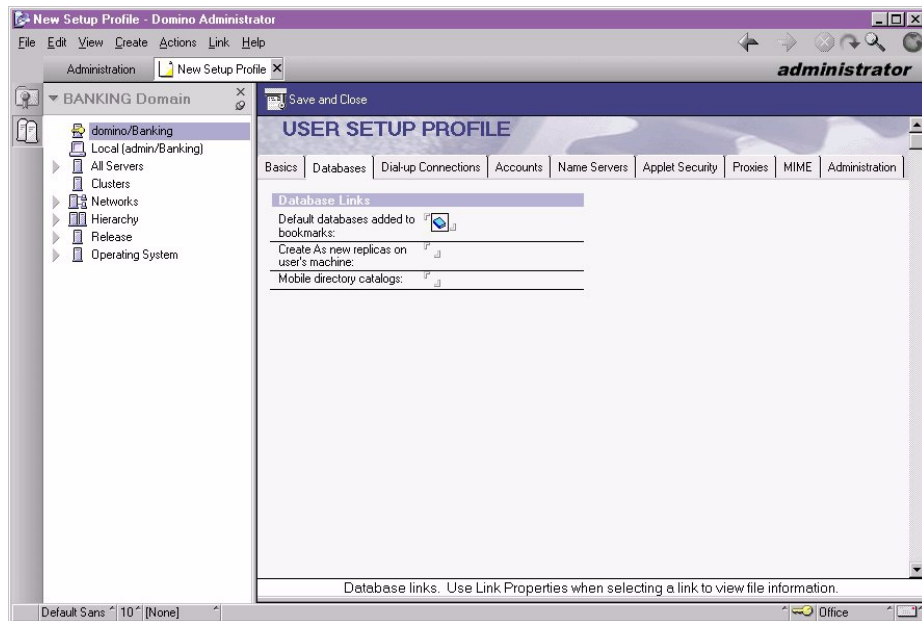


Figure 87. Domino Administrator: Defining database links in the profile

14. Save and close the profile.

There are many other settings that can be made in the profile. For details, see the Domino Administrator online help. The profile is now available to be assigned to users. This is easily be done during new user registration. Simply check the **Advanced** box in the Register Person window and select the **Other** button. The first entry on this page is the Setup profile definition as shown in Figure 88 on page 244.

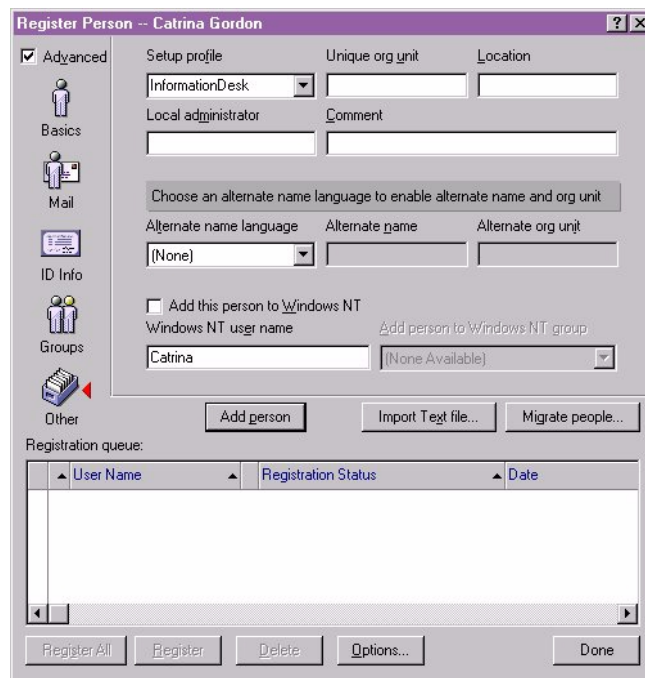


Figure 88. Domino Administrator: Assigning a profile to a new user

To assign a profile to an existing user, or switch them to a different profile, open the **People** view in the Domino Directory. The Setup Profile name is entered into the appropriate field on the Administration tab in the person document for the user.

As previously stated, the next time the user signs on, the settings will be applied dynamically. If databases are specified to be replicated, replication will take place as defined in the Connection or Location document.

7.3.4 Registering a new user

Registering people is one of the most common administrative tasks. There are several improvements in R5 compared with user registration in R4. For example, the Internet address format for new users, mail file quotas, and threshold levels may be set during registration. Options for controlling how duplicate person and mail file entries should be handled and specifying an alternative language for each user are also available. Lastly, Person registrations may be queued and changes may be made to any user properties at any time before running the registration process. Notice that the Advanced check box is marked, this enables access to the option of setting

this new user's Internet password. This is done by marking the **Set internet password** check box as shown in Figure 89.

Register Person -- New Entry

☒ **Advanced**

Registration Server: domino/Banking

First name: Catrina, Last name: Gordon, Short name: Catrina

Password: kittycat, Password Quality Scale: Weak to Strong

☒ **Set internet password** (Acceptable user password (8))

Internet address: Catrina@banking.net, Internet Domain: banking.net

The Internet address (above) is created using the person's name (above), the internet domain and internet address format components. You can also edit the internet address directly. It must be unique in the address book.

Buttons: Add person, Import Text file..., Migrate people...

Registration queue:

User Name	Registration Status	Date

Buttons: Register All, Register, Delete, Options..., Done

Figure 89. Domino Administrator: New person registration

To register a new person, follow these steps:

1. From the Domino Administrator default view, select **People => Register...** from the Tools pull-down menu.
2. Enter the Administrator password as prompted. Click **OK**.
3. Click the **Advanced** check box to allow the creation of Internet passwords for WebMail Clients.
4. Complete the information as shown in Figure 89. Be sure to check the box that says **Set internet password**.
5. Optionally, select **Other** to select a User Setup profile.
6. Click **Add Person** to place them in the registration queue as shown in Figure 90 on page 246.

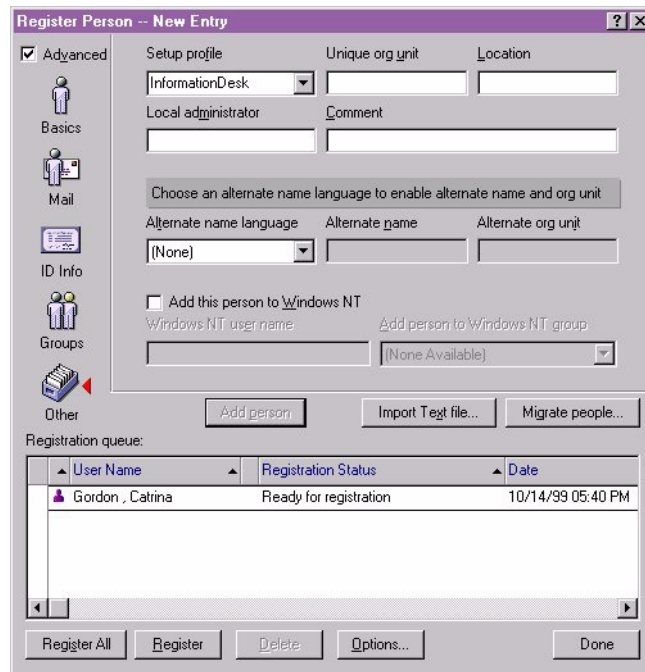


Figure 90. Domino Administrator: New person registration queue

7. Click **Register** or **Register All** to start the registration process, which may take some time to complete.
8. When the Notes Registration Successfully Completed message appears, click **Done**.

A very useful feature is the tool to help migrate users from an existing directory system. The supported directories include cc:Mail, GroupWise, LDIF, MS Mail, Netscape mail, and Windows NT users/groups. For example, an existing MS Mail directory may be imported into the Domino Directory. For detailed discussions about migrating from another mail system, see the IBM Redbooks *The Next Generation in Messaging: Moving from MS Mail to Lotus Notes and Domino*, SG24-5152, and *Eight Steps to a Successful Messaging Migration: A Planning Guide for Migrating to Lotus Notes and Domino*, SG24-5335. The latter book contains both general information and some specifics about migrating from Lotus cc:Mail.

7.4 Administering Domino R5 using Notes R4

Most of the Domino administrative tasks can be performed from a Notes R4 for OS/2 workstation, but there are some restrictions. The R5 database designs use several new features such as 3D tables, framesets, outlines, and pages that the R4 client cannot correctly display. One such example is the R5 Connection document. This document includes some of the new design elements. As a result, the R4 client cannot display it properly.

Other notable exceptions to administering a Domino R5 server from a Notes R4 workstation include the inability to:

- Work with certificates.
- Create a connection document.
- Edit or create a holiday document.
- Set an Internet password or mail file quota when registering a new user.
- Work with Person documents and Groups

Another limitation in registering new persons from R4 client is that none of the new R5 features are available, such as setting Internet passwords, Internet addresses, or database quotas and warning thresholds. Also, no support exists for selecting an alternative language.

R4/R5 User Administration

If you intend to use Domino R5 servers without using any of the R5 templates, most administration tasks can be performed with an OS/2 R4.x client. However, if you plan to have a mixture of R4, R5, and Web user clients, an R5 Domino Administrator client is required.

7.4.1 Registering and working with servers

The Server Registration procedure is the same as in Domino R4. Several new fields and pages have been added to this document, including:

- Directory Assistance database name
- Directory Catalog database name
- Domain Indexer page
- Directory Cataloger page
- Internet Cluster Manager page
- Transaction logging page

- Working with the Server views in the Domino Directory

To open the server administration from a Notes R4 Client, select **File => Tools => Server Administration**. The Administration window displays as shown in Figure 91.

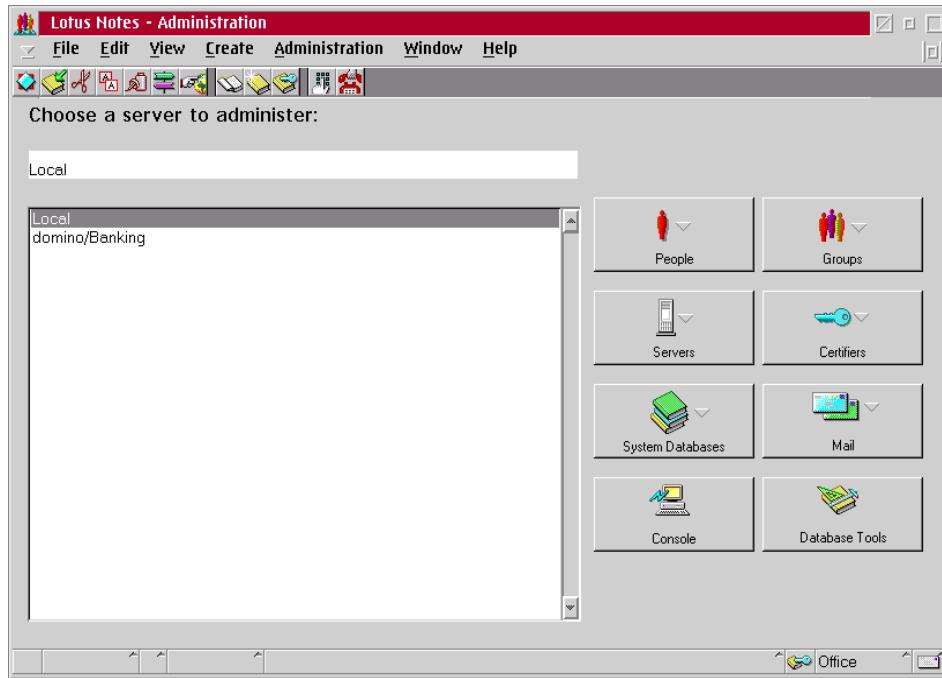


Figure 91. R4 Client: Notes R4 server administration tools

The servers are listed in the left pane while the command buttons are displayed in the right pane. An arrowhead on a command button indicates a menu of further choices will display when the button is clicked. The Server/Certificates view of the Domino Directory from Notes R4 Administrator is shown in Figure 92 on page 249.

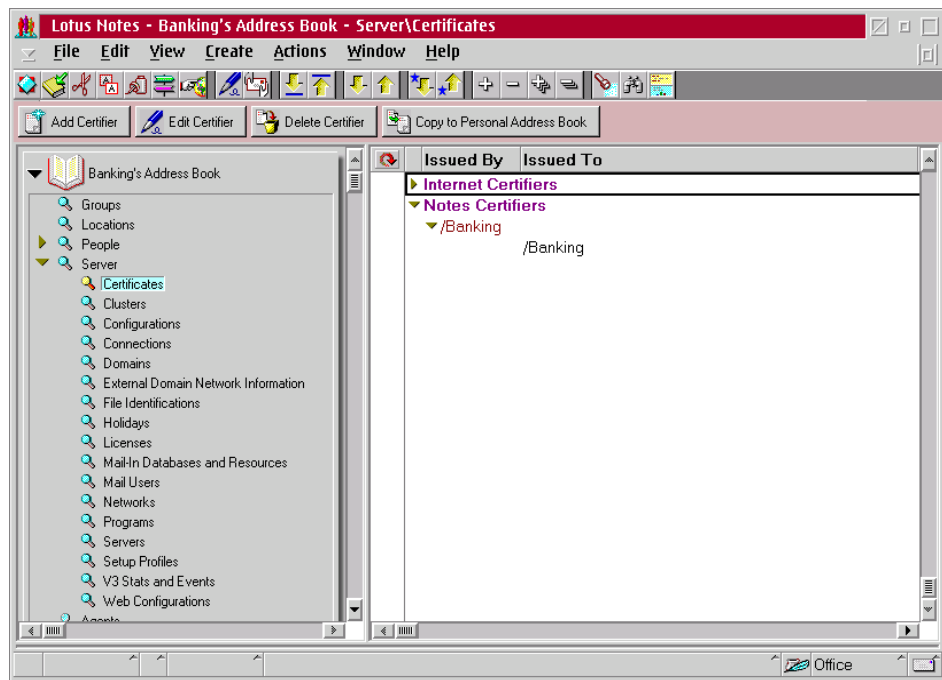


Figure 92. R4 Client: Notes R4 Server/Certificates view

While the certificates are displayed, any attempt to open or create a certificate results in the error message as shown in Figure 93 on page 250.

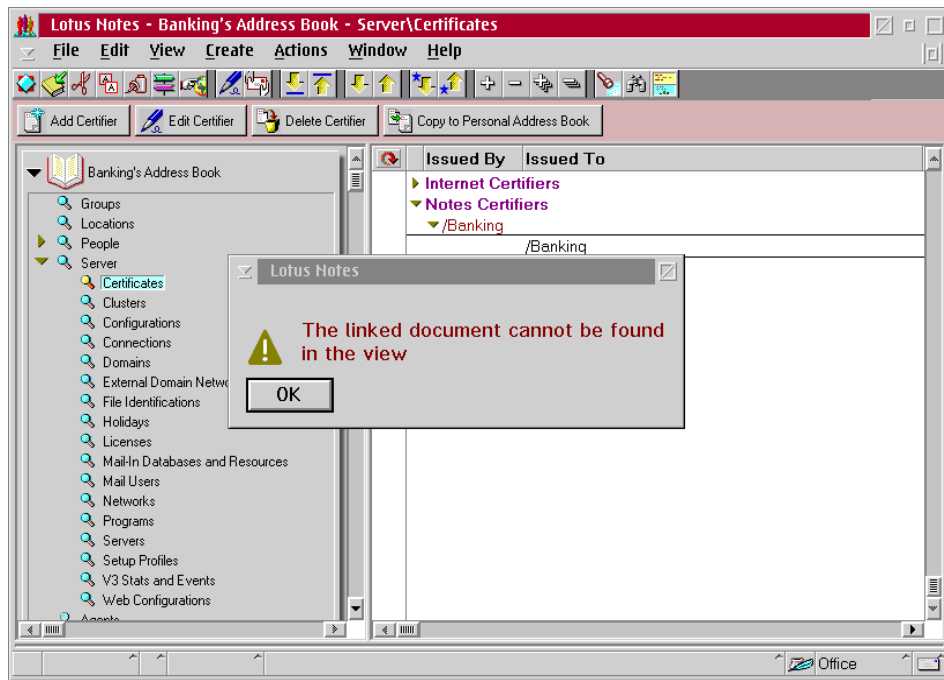


Figure 93. R4 Client: Notes R4 error message

Similarly, new organizations and organization units can be created from the Administration view shown in Figure 91 on page 248, but the corresponding certifier documents cannot be managed from this view.

The only new cluster-oriented features is the ability to fail-over Internet clients and the Internet Cluster Manager (ICM) feature. Therefore, all cluster features may be managed from an R4 client. However, when working with server configurations, there is a difference between R4.5 and R4.6 clients. A R4.6 client is capable of viewing, editing, and creating new Server Configuration documents while an R4.5 client can only view the current settings. Any attempts to save a modified or new document from an R4.5 client result in an error message which halts the save operation. Similarly, working with server connections failed from both the R4.6 and R4.5 client with the error message as shown in Figure 93. Yet working with Deny Access Groups, Domains, and File Identifications are all possible from an R4 OS/2 client.

A completely new Domino R5 feature is holidays. While holidays can be viewed from an R4 client, the corresponding documents cannot be opened, edited, or created. The remaining views, Licenses, Mail-In Databases and

Resources, Mail Users, Networks, Programs, Servers, Setup Profiles, V3 Stats and Events, and Web Configurations seem to work.

Chapter 8. Administering the OS/2 Domino R5 server: Part 2

This chapter illustrates how the Domino Web Administrator can be used to manage Domino R5 servers. It also provides an overview of the Tivoli Manager for Domino module, which operates in either the Tivoli Framework or Tivoli IT Director environment. With this administration module, Domino can be integrated into the system management environment. These methods, along with those previously discussed in Chapter 7, "Administering the OS/2 Domino R5 server: Part 1" on page 223, all provide ways to administer Domino servers.

8.1 Using the Domino Web Administrator

Domino R5 includes a special database, webadmin.nsf, that is used to perform many of the administration tasks. This includes changing database ACLs, viewing users or servers, and accessing the remote server console all from a Web browser. Each server maintains its own, independent copy of the database. Because each server has its unique copy of this database, it is not replicated between Domino servers. The limitations of the Domino Web Administration are described in 8.1.5, "Domino Web Administrator limitations" on page 277. The most notable exceptions include the inability to manage more than one server at a time or to register new users and servers.

8.1.1 Domino Web Administrator features

Table 25 lists the features that may be managed via the Web. The value, R4, in the Supported column indicates that even though the corresponding feature cannot be managed through the Web, it can be administered by the Notes R4 Client.

Table 25. Web Administrator features

Features	Supported
Console	
Command send and receive result or Live console	Yes
Databases...	
<i>Create...</i>	
Create database (with options Inherit future design changes, create full text index)	Yes
<i>Tools...</i>	

Features	Supported
Delete database	Yes
Compact database	Yes
Create full text index	Yes
Replicate database	Yes
New copy of database	Yes
Create a new replica	Yes
Set size quota	Yes
Cluster Management	R4
Set Administration Server	R4
Analyze database	R4
Enable/Disable Consistent ACL	R4
Database Fixup	R4
Move database	R4
Multiple database indexing	R4
NotesID	R4
Set database quota	R4
Sign a database	R4
<i>Access Control...</i>	
Add/Remove access control	Yes
Set roles	Yes
Display change history	Yes
Set Maximum Internet name and password access	Yes
<i>Sizes...</i>	
Display databases' size and usage percentage	Yes
<i>Usage</i>	
Display database usage activities	Yes
<i>Catalog</i>	

Features	Supported
Display database catalog	Yes
Directories...	
<i>People</i>	
View/Edit/Add/Delete person document	Yes
Register person	R4
<i>Groups</i>	
View/Edit/Add/Delete group document	Yes
<i>Deny Access Groups</i>	
View/Edit/Add/Delete deny access group	Yes
<i>Alternate Language Information</i>	
View alternate language information document	Yes
Replication	
<i>Replication Events</i>	
View replication events	Yes
Messaging...	
<i>Routing Status</i>	
View the number of dead mail	Yes
View the number of waiting mail	Yes
<i>Mail Reports</i>	
Run mail report	Yes
View mail report	Yes
<i>Tracking Center</i>	
Track a mail message	Yes
<i>Shared Mail</i>	
View Object Store Usage	Yes
<i>Routing Events</i>	
View Mail Routing Events	Yes

Features	Supported
<i>Mail Users</i>	
Add/Edit/Delete mail users	Yes
Analysis...	
<i>Logfile</i>	
View Notes log	Yes
<i>Administration Requests</i>	
View Administration Requests	Yes
<i>Alerts</i>	
View the statistics of alert (Alert Message Center)	Yes
<i>Memory</i>	
Shows memory usage and summarized status	Yes
<i>Diskspace</i>	
Shows Used/Free status of each disk	Yes
<i>Web Statistics</i>	
Shows Domino HTTP Requests	Yes
Shows Domino HTTP Commands	Yes
Configuration	
<i>Servers</i>	
View/Edit Server document	Yes
Add/Delete Server document	R4
Register Server	R4
<i>Clusters</i>	
View Cluster document	Yes
Add/Edit/Delete Cluster document	R4
<i>Domains</i>	
View/Add/Edit Domain document	Yes
<i>Configurations</i>	

Features	Supported
View Server configuration document	Yes
Add/Edit/Delete Server configuration document	R4
<i>Web Configuration</i>	
View/Edit File Protection	Yes
<i>Connections</i>	
View/Add/Edit Connection document	Yes
Delete Connection document	R4
<i>Programs</i>	
View/Add/Edit Program	Yes
<i>System Files...</i>	
View/Edit text file on the remote host system	Yes
Preferences	
View/Change User Interface	Yes
View/Change Domino Directory	Yes
Help	
View Lotus Domino and Notes Help	Yes

8.1.2 Configuring the Web Administrator

In order to enable Domino administration from the Web, verify that the following procedures have been performed:

1. The server that is to be administered must be configured as a Domino Web server. This includes running the TCP/IP protocol and the HTTP server task. For more information on TCP/IP enablement, refer to 2.2.1, "Running Lotus Domino R5 on TCP/IP" on page 28. Information on HTTP server setup can be found in 3.2.8.1, "Loading the HTTP Task" on page 78.
2. The Web user must have administrator access to the Web Administrator database (webadmin.nsf). Edit the Administrator of the server from a browser field in the server document by adding the administrator or group name(s).

3. Each administrator must have an Internet password set in their Person document (or obtain an SSL client certificate, if required by the Domino server). By default, name and password authentication is enabled for the HTTP protocol.
4. JavaScript must be enabled in Netscape.

8.1.2.1 Setting up access to the Web Administrator database

The Web Administrator database (webadmin.nsf) is created the first time the HTTP starts. At that time, Domino automatically grants access to this database to all the names listed in the Administrators field of the Server document. To allow additional administrators to use this database, you must give them the appropriate access and roles. For more information, refer to 8.1.4.1, "Assigning Administrative Privileges to Users" on page 259 and 8.1.4.3, "Web Administrator roles" on page 262.

8.1.2.2 Enabling JavaScript

To enable JavaScript in Netscape Navigator, from the browser tool bar:

1. Select **Edit => Preferences**.
2. Double-click the **Advanced** category.
3. Click the **Enable JavaScript** check box then click **OK**.

8.1.3 Starting the Web Administrator

To begin administering a Domino server from a browser, follow these steps:

1. Open a supported Web browser, such as Netscape.
2. Enter the URL:

`http://<Domino Server>/webadmin.nsf`

Where <Domino Server> is the hostname or IP address of the server to be administered.

3. When prompted, enter the Administrator user name and Internet password.

After successful authentication, the default Domino Web Administrator view is displayed as shown in Figure 94 on page 259. This is the starting point for all administrative tasks.

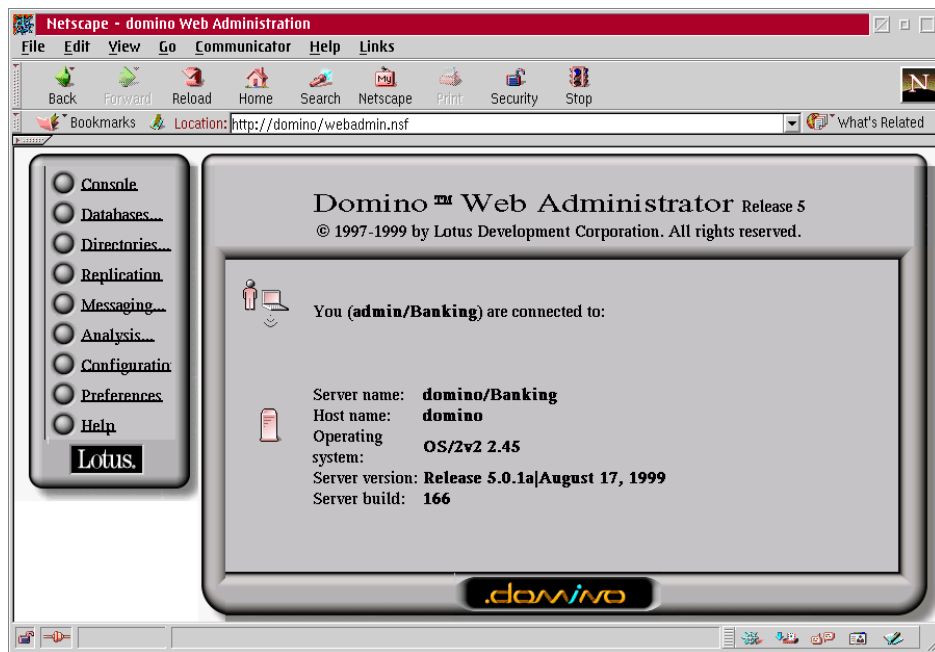


Figure 94. Web Admin: Default Domino Web Administrator view

The Web administrator user interface is divided into three parts. On the left is the command navigation bar. The corresponding subcommand buttons appear along the top. The third part of the interface is for further option selection and displaying the status and information on the selected command.

8.1.4 Performing Administrator tasks

Most of the key administrative functions can be performed via the Web Administrator. In this section, we explore several of these tasks. For more details, refer to 8.1.5, “Domino Web Administrator limitations” on page 277.

8.1.4.1 Assigning Administrative Privileges to Users

The Domino server sets the security for the webadmin.nsf database when the database is created. The webadmin.nsf database inherits user and group names listed in the *Administrators* field of the server document. In other words, all the administrators listed in the server document automatically become Web Administrators. To modify this, follow these steps:

1. From the default Domino Administrator view, click the **Databases...** button.
2. Click the **Access Controls** button.

3. Enter the Web administration database (`webadmin.nsf`) and press **Enter** or scroll down to select it and press the **Access** button as shown in Figure 95.

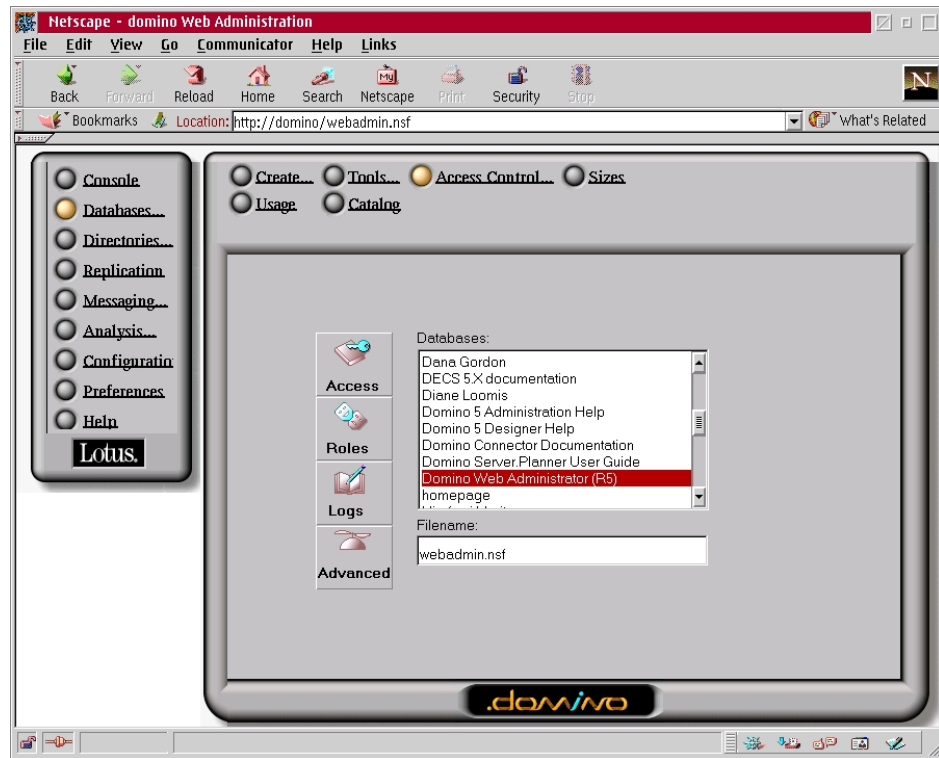


Figure 95. Web Admin: Databases Access Control

4. Add the user name of the administrator (or group name) to the ACL and grant them **Manager** access as shown in Figure 96 on page 261.

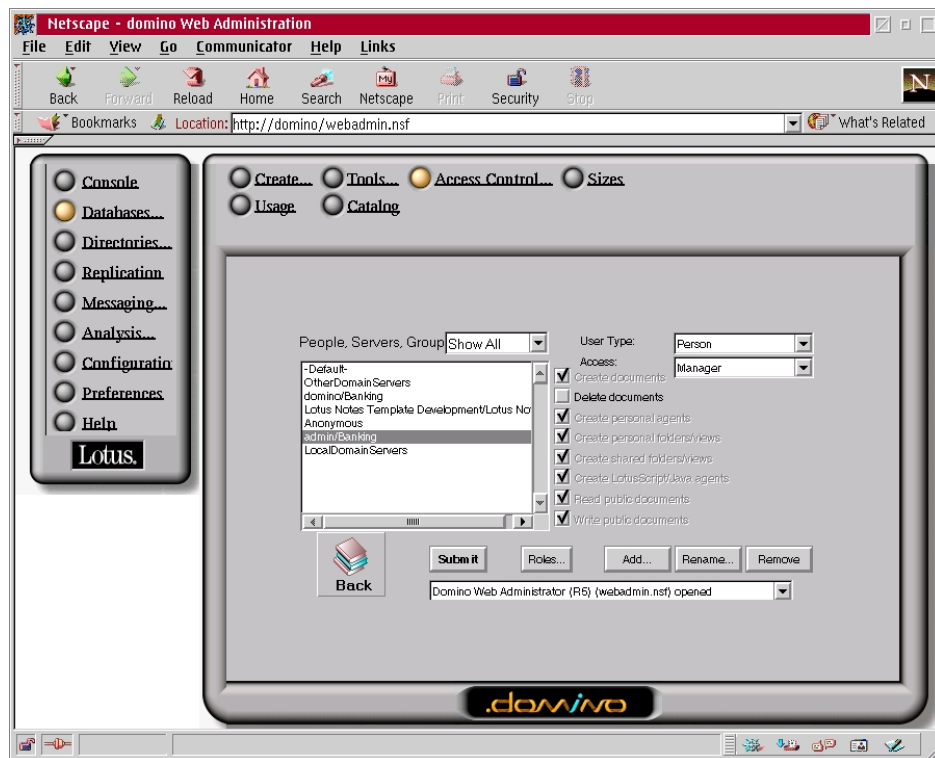


Figure 96. Web Admin: Assigning ACLs

5. Click the **Roles...** button. The Roles window appears as shown in Figure 97.

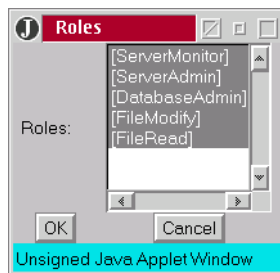


Figure 97. Web Admin: Roles window

6. From the Roles window, select the required roles for the user or user group. For more information, refer to 8.1.4.3, “Web Administrator roles” on page 262.

7. Click the **Submit** button.

Watch the space where the database name appears. It will change to `processed`.

To enable the browser access, an Internet password must be defined for the user or user group as shown in 8.1.4.4, “Changing or setting the Internet password” on page 264.

8.1.4.2 Editing the Server document

To enable additional users or groups to administer a server from a Web browser, follow these steps:

1. From the default Domino Administrator view, click the **Configuration** button.
2. Select the **Servers** button.
3. Double-click the appropriate server document to open it.
4. Click **Edit Server**.
5. Scroll down to the **Administer the server from a browser** field. User or group names added to this field will be allowed to use the Web Administrator interface to manage this server.
6. Click the **Save and Close** button.

8.1.4.3 Web Administrator roles

The options and actions displayed in the Web administration interface depend on the roles that are assigned to the user. Defining the right roles for administrators is part of the Domino network design. The available roles in

the webadmin.nsf database are listed from the most powerful role to read-only access only, as described in Table 26.

Table 26. Web Administrator roles

Role	Role Features
ServerAdmin	This role grants the user access to all of the following commands: - Console - Messaging - Directories The user also gains access to the following Configuration commands: - Servers - Clusters - Domains - Configurations - Web Configurations - Connections - Programs
ServerMonitor	This role grants access to all following commands: - Messaging - Replication And enables the following Analysis commands: - Logfile - Statistics - Events - Memory - Diskspace - Alerts - Web Statistics - Billing
DatabaseAdmin	The DatabaseAdmin role provides access to the following Directories commands: - People - Groups
FileRead	This role gives user read-only access to the Configuration - System Files commands
FileModify	The FileModify role gives users both read and write access to the Configuration - System Files commands

Assigning the ServerAdmin role to a user gives them the highest set of privileges to administer the Domino server.

8.1.4.4 Changing or setting the Internet password

When a new user is registered from a Domino Administrator R5 for Windows client, the Internet password may have been set. This is not possible when a new user is registered from a Notes R4 Client. In either case, to set or change an existing Internet password from the Domino Web Administrator, follow these steps:

1. From the default Domino Web Administrator view, click the **Directories...** button.
2. Click the **People** button.
3. A list of people in the Domino Directory for this server is displayed. Locate the user name for the administrator and double-click it to open the Person document.
4. From the Person document, click the **Edit Person** button.
5. Locate the Internet password field, as shown in Figure 98.

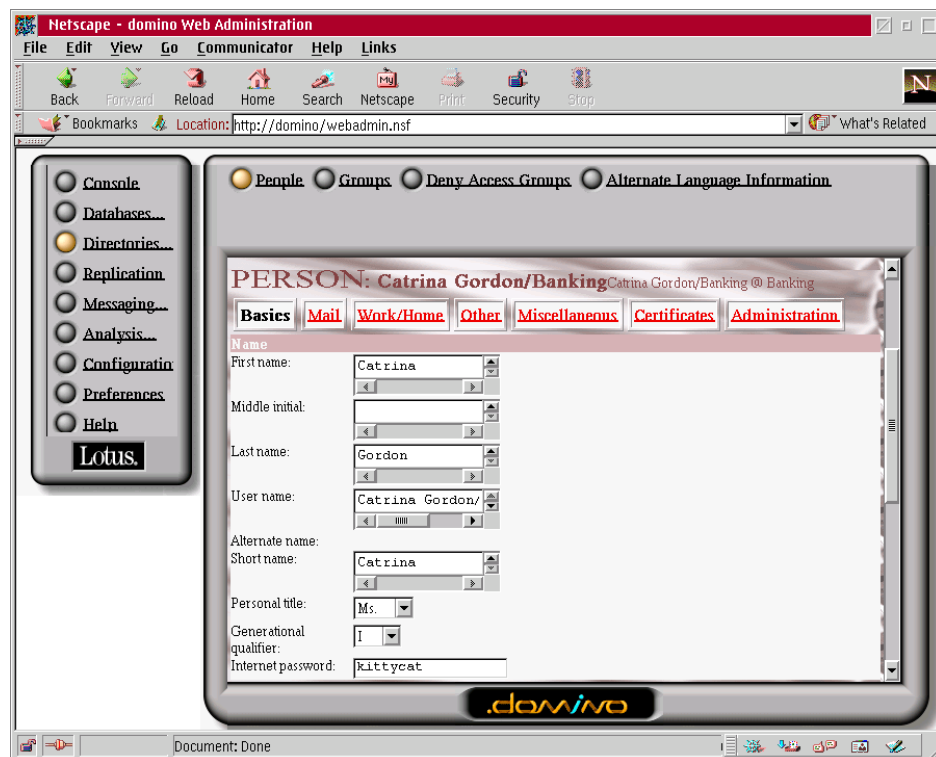


Figure 98. Web Admin: The Internet password field of a Person document

6. Enter a new Internet password, then save the changes by clicking the **Save and Close** button.

8.1.4.5 Changing the Maximum Internet name & password field

For security reasons, the default access control setting for Internet clients to most databases is Editor. To adjust this setting, follow these steps:

1. From the default Domino Web Administrator view, click the **Databases...** button.
2. Click the **Access Control...** button.
3. Select a database name listed in Databases text box.
4. Click the **Advanced** button.
5. Modify the Maximum Internet name & password access field, if required, for maximum Web access, as shown in Figure 99.

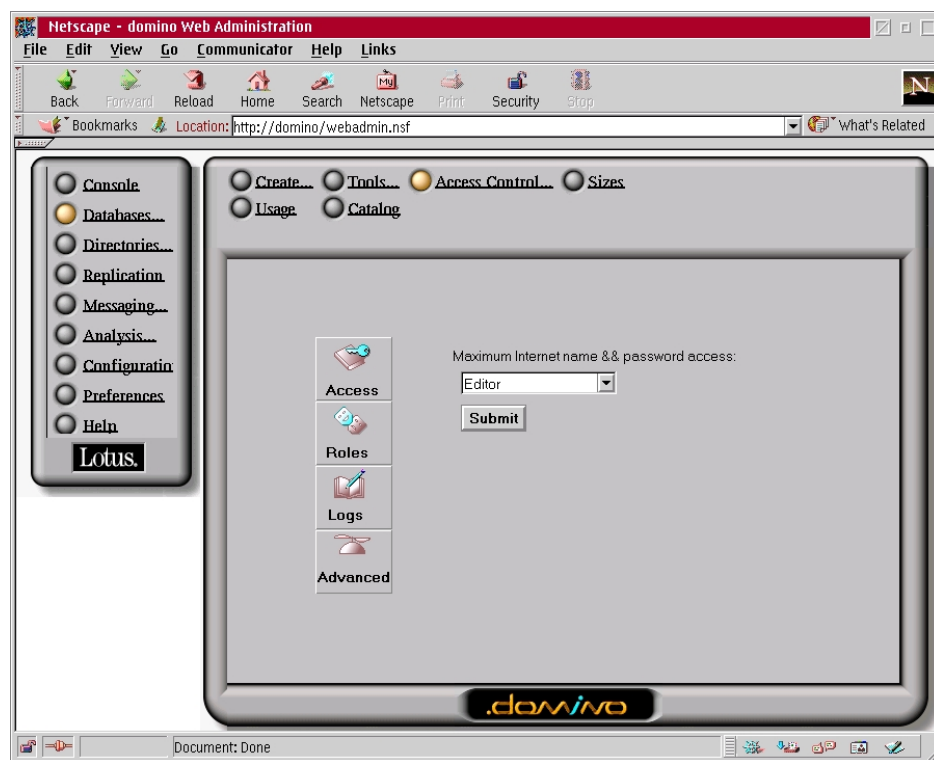


Figure 99. Web Admin: Maximum Internet name & password

6. Click the **Submit** button to apply the changes.

8.1.4.6 Creating Web mail users with Domino Web Administrator

The feature a Domino administrator uses most is probably registering new users. As mentioned earlier in this chapter, registering Notes users from the Domino Web Administrator is not possible. This is because it does not support using certifier key files via the Web. In other words, you are not able to create a private key for a user from the Web browser.

A Web browser can be used to create new Web users. You can also create and assign a mail file for a user, although this is performed as a separate task.

Note

Adding a new Person document does not register a person or create a mail file, it simply creates a person document.

To create a new Web user, follow the instructions below:

1. From the default Domino Web Administrator view, click the **Directories...** button.
2. Click the **People** button.
3. Click the **Add Person** button to create a new Person document. By default, the Basics page is displayed as shown in Figure 100 on page 267.

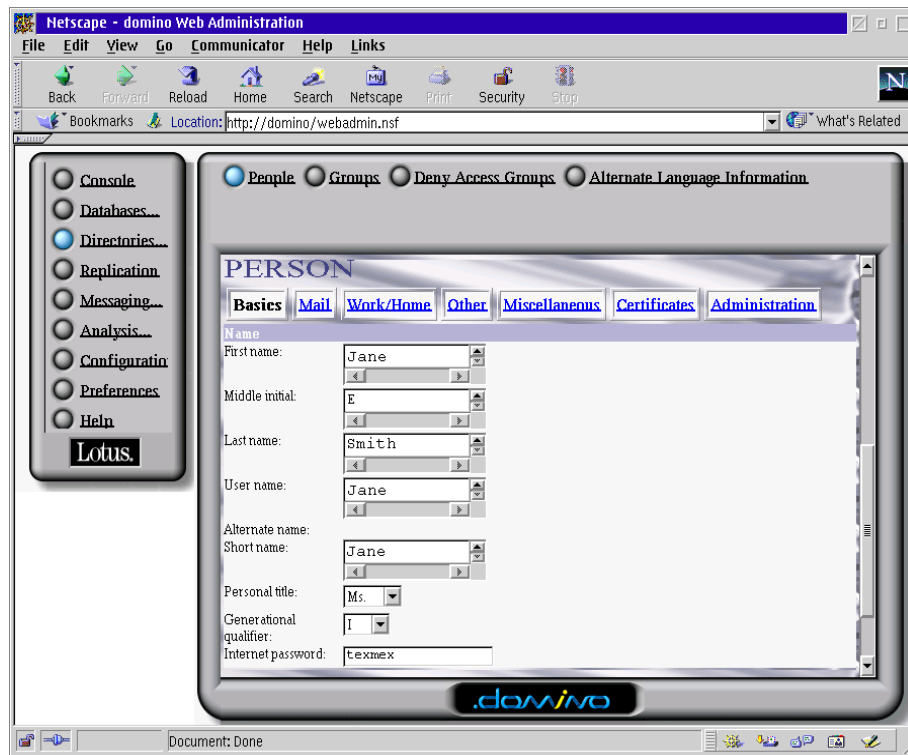


Figure 100. Web Admin: New Person document – Basics

4. Fill in the following fields:

First name	User's first name.
Middle initial	User's middle initial.
Last name	User's last name (required).
User name	User names assigned to this user (required). It is recommended to define the fully qualified user name, for example, Jane Smith/Banking. You can also define several users names, for example, in addition to the previous example, Jane Smith. Separate multiple entries by carriage return.
Alternate name/Short name	The alternate or short name can be used for authentication from an Internet client depending on the server settings.

Personal title	Any of the following: Mr., Ms., Mrs., Miss, Dr., Prof.
Generational qualifier	Change the generation qualifier from the default if required.
Internet password	This is the user password that is entered when logging on (authenticating) from the Web browser (required in this case).

5. Select the page.

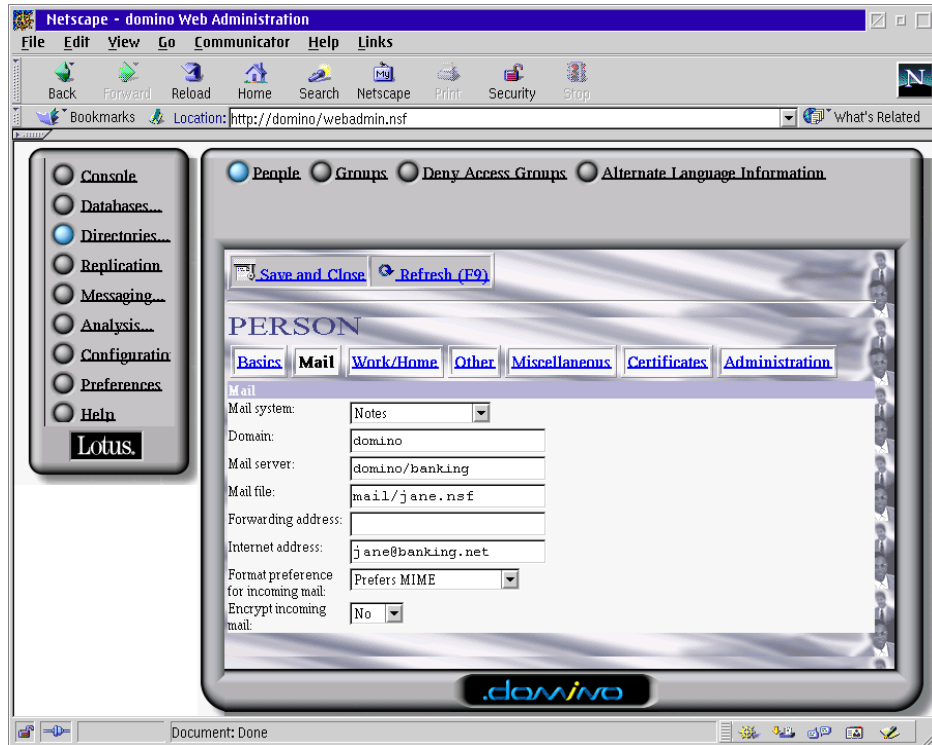


Figure 101. Web Admin: New person document – Mail

6. Provide the mail information as shown in Figure 101:

Mail system	You can select the mail system to be Notes, cc:Mail, Other Internet Mail, POP or IMAP, X.400, Other, or None. When the mail file is located on a Domino server, set the mail system to Notes (required).
-------------	--

Domain	This is the name of the Notes mail domain (if Notes mail is selected).
Mail server	Name of the Domino server holding the mail file for the user. Defining a mail file here does not create the file or change ACL settings of an existing file (if Notes mail is selected).
Forwarding address	The mail address where this user's mail is forwarded. In this case, this field is left blank.
Internet address	In Web Administrator, you need to set Internet addresses manually; Internet address assistant is not available (required).
Format preference for incoming mail	Two choices available, either Prefers MIME or Prefers Notes Rich Text. In the case of an Internet user, MIME would be the preferable choice.
Encrypt incoming mail	To encrypt all the mail you receive, set this field to Yes.

7. Click **Save and Close** to save the new Person Document.

8.1.4.7 Creating the mail file

To create a mail file for a user, follow these steps:

1. From the default Domino Web Administrator view, click the **Databases...** button.
2. Click the **Create...** button.
3. Enter the required information for the new database as shown in Figure 102 on page 270.

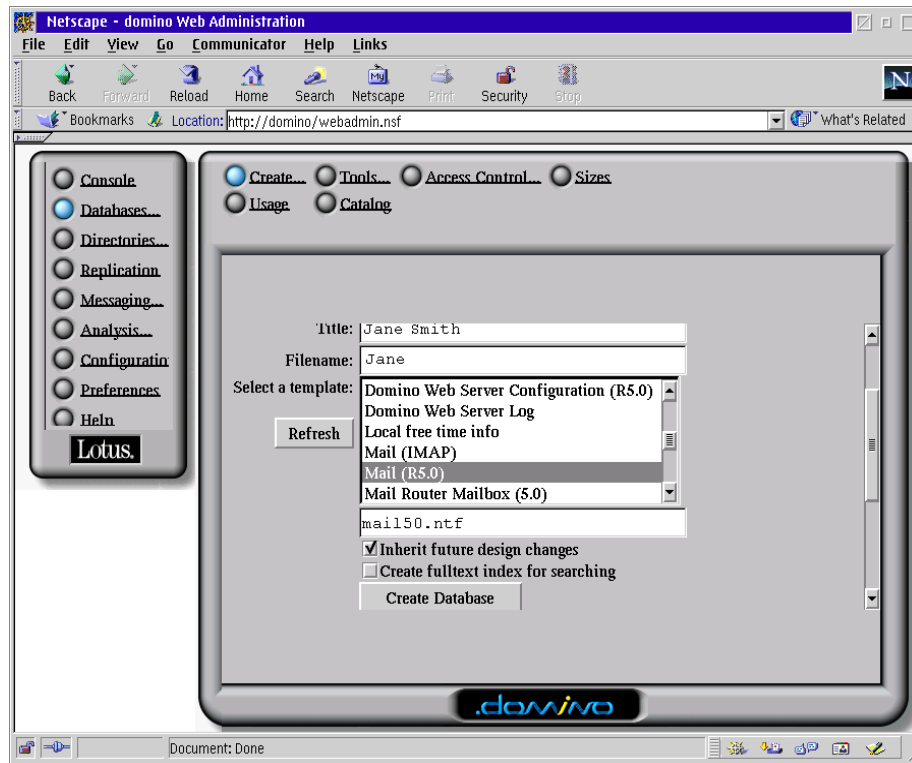


Figure 102. Web Admin: Creating the mail file for a new user

4. Enter the required information for the new databases as shown in Figure 102:

Title	It is recommended that the user's full name for the database title. For example, Jane Smith.
Filename	Enter the full path for the mail database relative to the server's data directory. For example, mail\JSmith.nsf. Long file names may be used so long as the file system on the drive where the Domino data directory resides supports this.
Template	Select the Mail (R5.0) database template for the mail file.
Inherit future design changes	Check this box to ensure the new mail file template is automatically propagated.

Create fulltext index for searching

To enable search capabilities from the Web client, the mail database must be full text indexed.

5. As shown in Figure 102 on page 270, click the **Create Database** button to create the actual database. A Database successfully created message is displayed.

If you have changed the Maximum Internet name and password setting for the database, continue to the next step. Otherwise, see 8.1.4.5, "Changing the Maximum Internet name && password field" on page 265.

6. Click the **Databases...** button.
7. Click the **Access Control** button to set the ACL for the new mail database.
8. Select the mail database from the Databases list and click the **Access** button to open the Access Control List as shown in Figure 103. Set the Access field from Default to **No Access**.

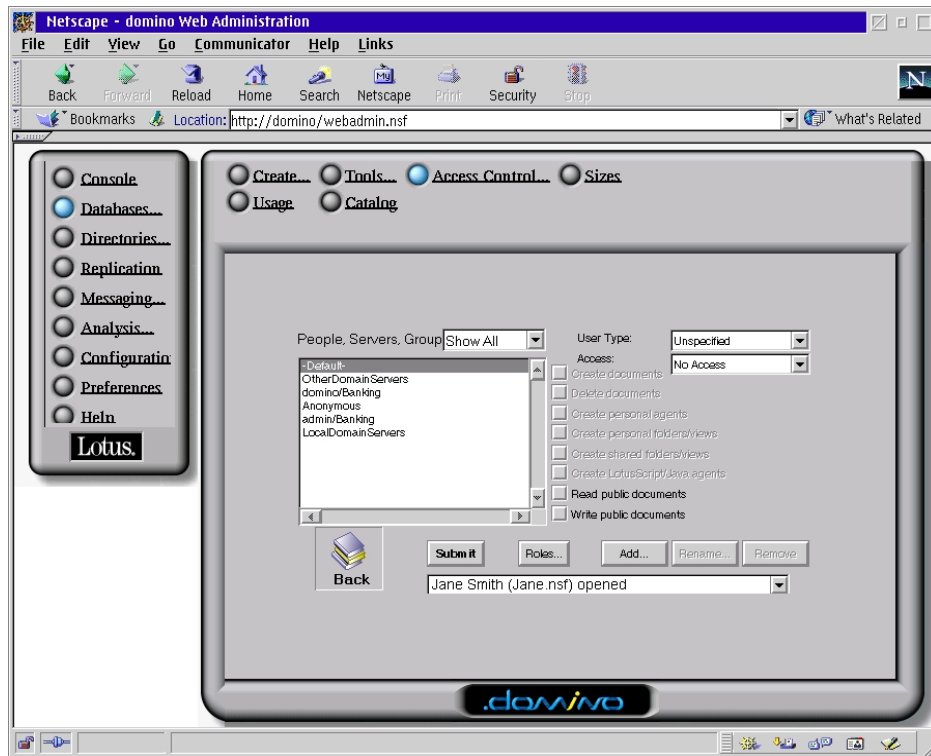


Figure 103. Web Admin: Mail file access control

9. Click the **Add** button to add a new ACL entry.

The Add User dialog window is displayed as shown in Figure 104. Enter the mail file owner's full name and press **OK**.

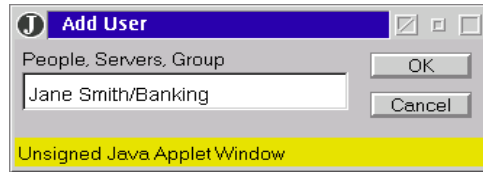


Figure 104. Web Admin: Add a new database ACL

10. Select the new user from the step before, set the user type to **Person**, and the Access to **Manager** as shown in Figure 105.

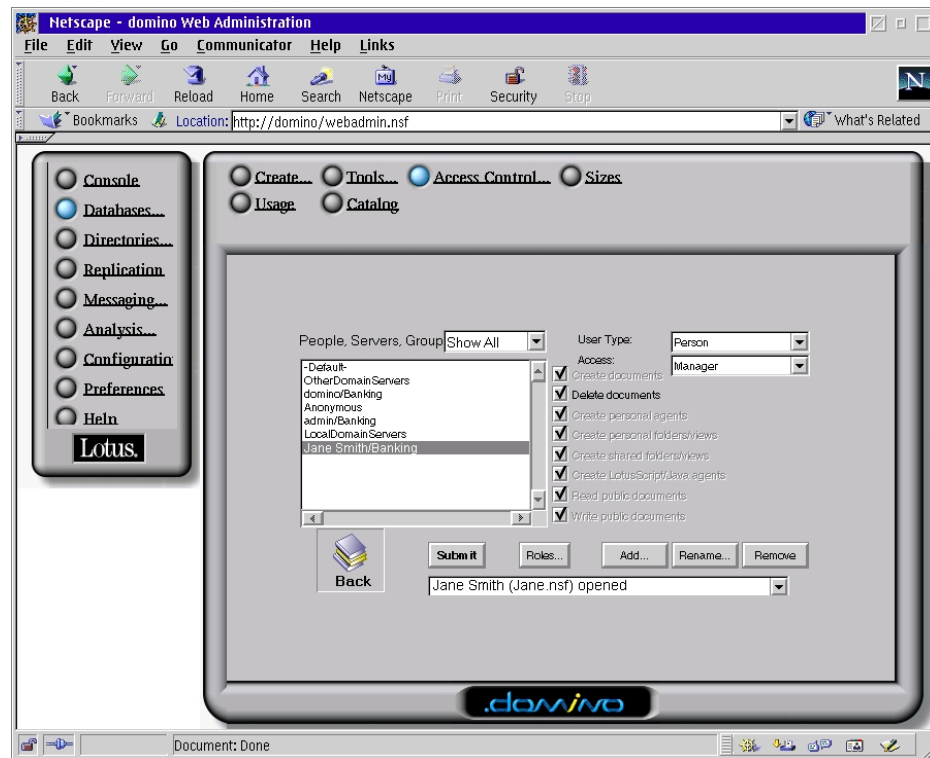


Figure 105. Web Admin: Changing the ACL settings

11. Click the **Submit** button to propagate the changes in the ACL. Watch the space where the database name appears. It will change to processed.

The new user and mail databases are now created and access controls have been set on the mail database file. The user can access the mail file and server only from a Web browser. The Domino Web Administrator is not capable of creating an ID file or public key for the user.

8.1.4.8 Directories

To work with the Domino Directory from the Web Administrator, select the **Directories...** icon on the left. In this view, you can work with People, Groups, Deny Access Groups, and Alternate Language Information.

From here you can add Person documents, delete and modify persons and groups, and display information. The People view of the Domino Directory command is shown in Figure 106.

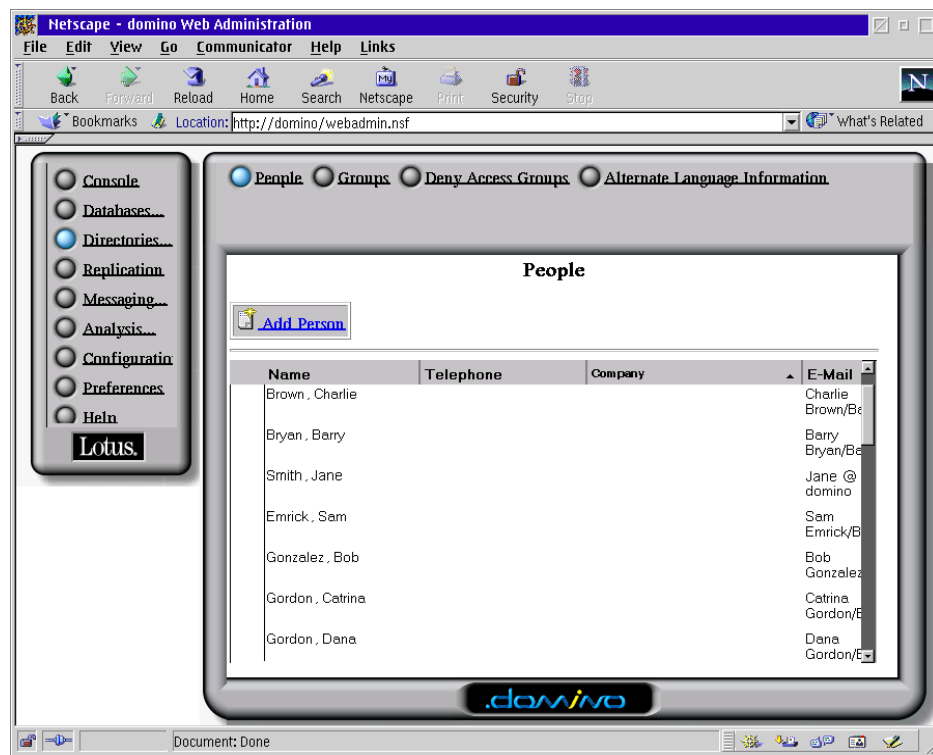


Figure 106. Web Admin: People view of the Domino Directory

The Domino Web Administrator Add Person Feature

The Add Person feature in the Domino Web Administrator corresponds to the Add Person function from within the Domino Administrator for Windows. In the Domino Administrator, this function is found in the People & Groups view of the Domino Directory. The Domino Web Administrator does not permit new user registration. This can only be done from the Domino Administrator.

Groups can be managed here including changing group information and members, adding new groups, and deleting existing groups. These are precisely the same functions contained in the Domino Administrator. The only difference is that the find feature is not implemented here and the Domino Directory cannot be accessed while adding group members.

8.1.4.9 Configuration

From the Configuration view, the following may be created, edited, modified, or deleted:

- Server documents
- Cluster documents
- Notes domain definitions
- Server connections
- Define and schedule programs
- View and edit any system file
- The following may be viewed and edited, but not created:
 - Server configurations
 - Web Server configurations

A sample Server - Servers view is shown in Figure 107 on page 275.

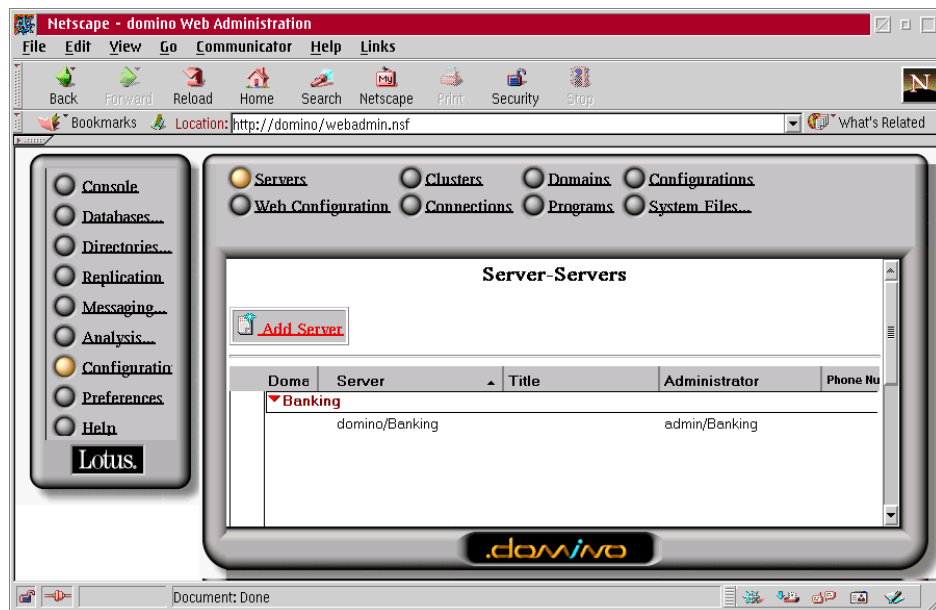


Figure 107. Web Admin: Server view of the Domino Directory

8.1.4.10 Preferences

The Preferences feature lets you set the Domino Web Administrator user interface style and select the current Domino Directory. The button interface is shown in Figure 108 on page 276.

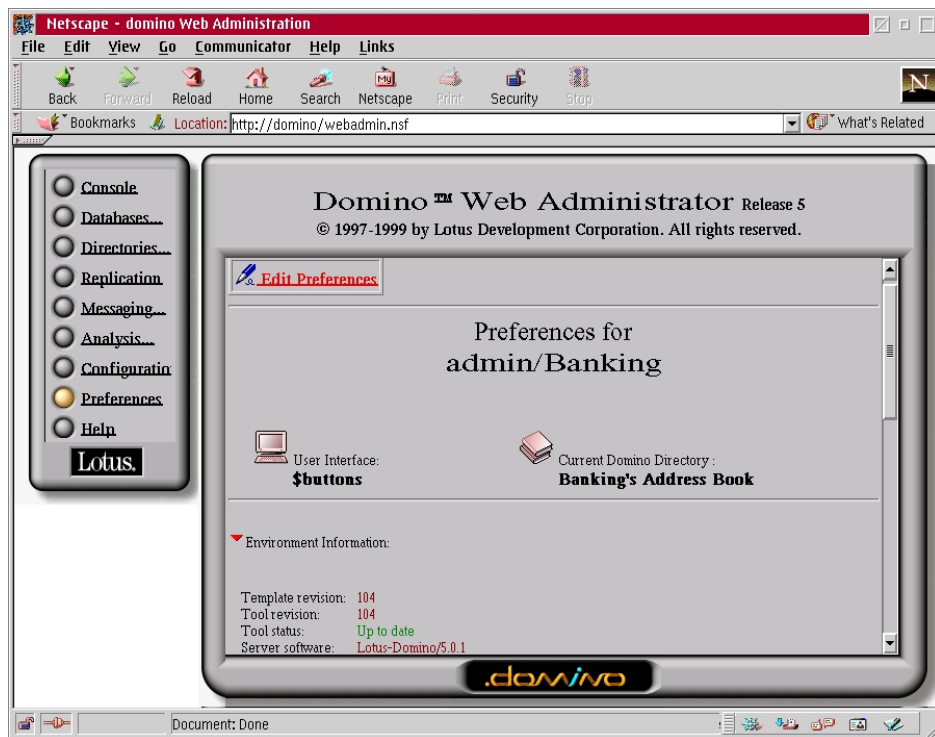


Figure 108. Web Admin: Changing the preferences

In OS/2 Domino R5, the default interface is Button. To maintain this default user interface, do not attempt to modify the setting because the only selectable user interface style available is the Plain Interface. Once this interface has been changed, it cannot be reset to Button. These settings are stored in a Profile document for the user ID that is currently logged in.

8.1.4.11 Server console

A remote server console is available from the Domino Web Administrator from which server commands can be issued in non-interactive mode. If the Live console option is checked, the real-time status of the remote server console is displayed as shown in Figure 109 on page 277.

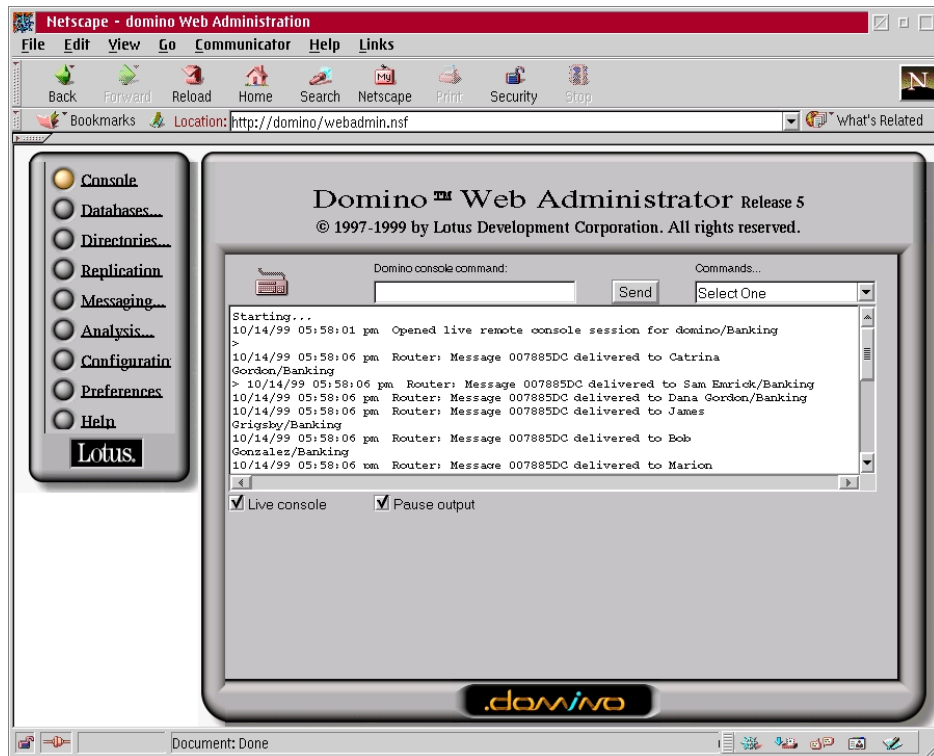


Figure 109. Web Admin: The Domino server console

In order to scroll back through the console output, check the Pause output option to temporarily halt the console display. This option is especially useful if the server is being accessed continuously. Every time a server event is written on the remote server screen, the console screen is scrolled to the last event on the server console.

8.1.4.12 Help

The Lotus Domino and Notes Help R5 database is accessed by clicking the **Help** icon on the left command pane. If the database is full text indexed, free searches for the database may be defined.

8.1.5 Domino Web Administrator limitations

As described in the previous sections, the Domino Web administrator is sufficient for server and user administration especially when a Domino Administration R5.0 for Windows client is unavailable. However, the limitations of this tool include the inability to:

- Manage multiple Domino servers without opening each individual server's webadmin.nsf database
- Register Notes users
- Register Domino servers
- Access the Directory Catalog
- Access Directory Assistance
- Edit Server documents
- Work with certificates
- Manage database and folder links
- Work with server statistics
- Display the replication topology
- View the replication schedule
- View license information
- Work with holidays
- Work with configuration and programs

Clearly, some of the core administration tasks are on the list, including User and Server Registration. As a result, registering Notes users or Domino servers require a Domino R5.0 Administrator. While Web users can be created and mail databases defined with the Domino Web Administrator, an associated notes.id file is not generated. This means the user is unable to access the server from a Notes workstation.

Managing multiple Notes domains from the Domino Web Administrator is also not possible from a single browser. This is due to the fact that the preferences option for defining multiple administration domains is not available. Instead, to manage another server, its webadmin.nsf database must be opened in a separate Domino Web Administrator browser. Support is also lacking for Bookmarks. Bookmarks allow for easy navigation between servers in the domain.

The Directory Catalog database features are not integrated with the Domino Web Administrator. The contents and configuration of the Directory Catalog database are viewed by opening the file in another browser session. To open the Directory Catalog, the file name must be known. This can be found in the Directory Catalog database name on this server field on the Basic page of the server document. Then, to open the database, issue the URL:

`http://<Domino Server>/DirCatFile.nsf`

Where `Domino Server` is the Directory Catalog database server and `DirCatFile.nsf` is the database file name. The information displayed cannot be changed nor is it possible to display an individual person or group document.

Directory Assistance is opened in the same manner as for the Directory Catalog database. However, it is possible to add or modify the Directory Assistance definition in the database.

The Web mail clients are not capable of importing holiday information. This same limitation applies to the Domino Web Administrator. From a server point of view, a more important feature is that you are not able to define server programs or server configurations in the Domino Web Administrator.

8.2 Tivoli Manager for Domino v1.5.2

As part of Tivoli's applications management initiative, Tivoli is working to create application management modules for large client/server applications. When installed on top of a Tivoli Enterprise environment, these application management modules will allow for automatic, full life-cycle management of the client/server application by making use of the functionality available from the Tivoli Enterprise software. The Tivoli Manager for Domino is one such module.

In this section, we provide a very brief overview of the functions and features of the Tivoli Manager for Domino to give a flavor of what is possible. To learn more about managing your Domino environment with Tivoli Framework, refer to the IBM publication *Managing Domino/Notes with Tivoli Manager for Domino Enterprise Edition*, SG24-2104. The book discusses Version 1.5, which for Domino is Versions 4.1 and 4.5, but the principles apply to Domino R5 as well. The newest version of Tivoli Manager for Domino is Version 1.5.2 and this version is certified to be used with Domino R5.

8.2.1 Overview of the Tivoli Manager for Domino

The Tivoli Manager for Domino allows for the management of Domino/Notes environments by providing the following features:

- Security enhancements.
- Task administration.
- Availability management.
- Automated Notes Client installation and upgrade.

- User management provided with the Admin Extension for Tivoli Manager for Domino.
- Electronic mail business system and Domino server component management with GEM, provided with the Tivoli GEM APM Extension for Tivoli Manager for Domino.

Since the Tivoli Manager for Domino utilizes the Tivoli Framework and Tivoli's other core applications, the functionality of the module provided may be customized and extended.

8.2.1.1 Security enhancements

Each Notes domain is configured within a Tivoli Management Region (TMR) as its own policy region. In addition, two resource roles are created for each configured Notes domain. Giving a Tivoli administrator one or both of these resource roles in a particular policy region authorizes the administrator to perform certain Notes tasks such as:

- Task administration

The Tivoli Manager for Domino provides tasks and jobs for configuring, operating, and maintaining Notes servers and users. In the Tivoli Enterprise environment, the term *task* refers to a defined action that is executed against a given group of managed nodes. A *job* refers to a resource consisting of a task and its predefined execution parameters, which includes the group of managed nodes against which the task will be executed. Jobs can be scheduled to run using the Scheduler. A task library is simply a container in which a Tivoli administrator can create and store tasks and jobs. Here, we will use the term task in a general sense to refer to Tivoli tasks or jobs.

Tasks in Tivoli Manager for Domino are organized into three task library categories: utilities, tasks, and user tasks. The task libraries contain both tasks and jobs.

- Utilities

This task library is made up of tasks used mostly for configuration, which are seldom used once the initial configuration enabling the Tivoli Manager for Domino to manage a Notes installation is complete.

- Tasks

This task library contains common operational tasks that are used in the day-to-day administration and management of Notes servers.

- User tasks

This task library contains common operational tasks that are used in the day-to-day administration and management of Notes users.

Table 27. Tivoli Manager for Domino supported tasks

Type of task	Supported tasks
Utilities task library	
Tivoli Configuration Tasks	Configure Event Server
	Configure TME 10 for a Notes domain
	Configure and deconfigure the Notes Admin Extension
	Enable and disable a user profile
Notes Domain Policy Region Configuration Tasks	Configure client install
	Configure client update
	Configure event console
	Configure remote console
	Configure Tivoli 10 for a server
	Create a new client list
Tasks task library	
Notes Server Tasks	Start and stop the Domino server
	Start and stop the Domino server monitors
	Start and stop the Notes event adapters
	Execute remote console command
	Show Domino server statistics
	Start the administration client for the Domino server
User tasks task library	
Notes User Tasks	Add users to Notes domain
	Delete users from Notes domain
	Get user information from a Notes domain
	Modify user information
	Resend a Notes user ID
	Install Notes Client on a workstation

8.2.1.2 Availability management

Managing the availability of a Domino server with the Tivoli Manager for Domino includes the following features:

- Tivoli Event Adapter for Alert Monitoring
- Tivoli Notes Monitor Collections
- Event Filtering
- Tivoli Event Server Rulebase

8.2.1.3 Automated Notes Client installation

Manager for Domino also provides automated Notes Client installations and upgrades. Features included in the support are tasks for creating Notes Client installation or upgrade file packages, administrator-defined file pack organization, and pre-configured client distribution support.

8.2.1.4 User management with the Admin Extension

If you have the Tivoli Manager for Domino Admin Extension installed, you can manage Notes users by distributing user profiles using profile managers to subscribers (Notes users). Included in the management of users through the Admin extension is adding, modifying, and deleting user information from the Domino Directory.

8.2.1.5 Business system management

With the Tivoli GEM APM Extension, you can manage your Domino servers as part of an electronic mail business system using Tivoli GEM. The Domino servers are discovered through heartbeat events and are managed through monitoring and task administration. Connections between Domino servers are also discovered and graphically displayed.

Appendix A. Obtaining FixPaks

All software discussed in this book requires certain FixPak levels in order to be Year 2000 compliant and to work properly with Domino R5. This appendix provides information about FixPak releases.

Basically, the majority of FixPaks for OS/2-based products can be downloaded from a single Internet Web site (all host names represent the same system):

```
ftp://ps.software.ibm.com/ps/products  
ftp://ftp.software.ibm.com/ps/products  
ftp://service.boulder.ibm.com/ps/products
```

As for OS/2 Warp Server, fixes for the various components can be found in the OS/2, LAN, MPTS, or TCP/IP sections, depending on which product(s) you need to service. There is no combined FixPak for the OS/2 Warp Server bundle.

A.1 The OS/2 Warp Server base operating system

To retrieve the latest FixPak for OS/2 Warp Server's base operating system, which is based on OS/2 Warp 3, go to the following URL:

```
ftp://ps.software.ibm.com/ps/products/os2/fixes/v3.0warp
```

From there, choose the appropriate country subdirectory.

A.2 OS/2 Warp Server Multiple Protocol Transport Services (MPTS)

To retrieve the latest FixPak for the OS/2 Warp Server MPTS, go to the following URL:

```
ftp://ps.software.ibm.com/ps/products/mpts/fixes/
```

From there, choose the appropriate country subdirectory. The WRx8610 (the letter x represents the country code) FixPak will service all MPTS versions except WorkSpace On-Demand Release 1 clients.

The WRx8620 package requires that you have the refresh of the MPTS LAN Adapter and Protocol Support that was included with either WRx8600 or WRx8610. WRx8600 is the MPTS portion of TCP/IP 4.1 for OS/2 that is available from IBM Software Choice.

A.3 OS/2 Warp Server File and Print Services (LAN Server 5.0)

OS/2 Warp Server File and Print Services is internally known as LAN Server 5. Due to a merging of the service lines for LAN Server 5.0 UNI and LAN Server 5.0 SMP, it is no longer necessary to have different FixPaks for UNI and SMP. Therefore, the latest FixPaks for all LAN Server 5.0 machines will be available at the following URL:

ftp://ps.software.ibm.com/ps/products/lan/fixes/lsv5.0_uni-smp/

A.4 TCP/IP

To retrieve the latest versions of TCP/IP FixPak releases (all in American English), go to the following URL is:

For TCP/IP 3.1 (included in OS/2 Warp Server V4):

<ftp://ps.software.ibm.com/ps/products/tcpip/fixes/v3.1os2/>

For TCP/IP 3.5 (included in OS/2 Warp Server V4 SMP):

<ftp://ps.software.ibm.com/ps/products/tcpip/fixes/v3.5os2/>

For TCP/IP 4.1 (available from Software Choice):

<ftp://ps.software.ibm.com/ps/products/tcpip/fixes/v4.1os2/>

For TCP/IP 4.2 (included in WorkSpace On-Demand V2):

<ftp://ps.software.ibm.com/ps/products/tcpip/fixes/v4.2os2/>

A.5 Netscape Communicator

To retrieve the latest versions of Netscape Communicator products, go to the following URL:

<ftp://ps.software.ibm.com/ps/products/netscape/fixes/>

A.6 Java

To retrieve the latest versions of OS/2 JVMs, for example, V1.1.8, go to the following URL:

<ftp://ftp.hursley.ibm.com/pub/java/fixes/os2/11/118>

At the time of this writing, a November 5 refresh version was available.

Appendix B. Domino URLs

Domino uses URLs to access servers, databases, and other components of a Web site and display them to Web users. Knowing Domino URL commands allows you to design links or enter commands directly into a browser to navigate a Domino site or to reach specific components quickly.

B.1 Domino URL command syntax

Domino URL commands have the following syntax:

```
http://Host/Database/DominoObject?Action&Arguments
```

Where:

- Host

DNS entry or an IP address

You cannot use the Domino server name unless it has a DNS entry.

- Database

Database can be one of the following:

- The database file name with the path relative to notes\data.
- The database replica ID.

- DominoObject

A Domino construct (a view, document, form, navigator, agent, and so forth.)

- Action

The desired operation on the specified Notes object, for example:

- ?OpenDatabase
- ?OpenView
- ?OpenDocument
- ?EditDocument
- ?OpenForm
- ?ReadForm

- Arguments

A qualifier of the action. For example, Count = 10 combined with the ?OpenView action limits the number of rows displayed in a view to 10.

Use the following guidelines when working with Domino URLs:

- Special identifiers used in Domino URL commands include:

\$defaultView, \$defaultForm, \$defaultNav, \$searchForm, \$file, \$icon, \$help, \$about. These special identifiers are described in the following sections of this appendix.

- DominoObject can be any of the following:
 - For a database, it is the database name or replica ID itself.
 - For other objects, the Domino object name or alias, Universal ID, Notes ID, or special identifier. For example, to specify a view in a URL, you can use any of the following: the view name, view Universal ID, view Notes ID, or \$defaultView.

A Domino object name and Universal ID are identical in all replicas of a database, but the Notes ID will probably change in database replicas. Therefore, it is best to use the Domino object name or Universal ID in URLs.

Note

We will not show Notes IDs and Universal IDs in this section.

- Action can be explicit or implicit.
 - Examples of explicit actions include ?OpenServer, ?OpenDatabase, ?OpenView, ?OpenDocument, ?OpenForm, and ?EditDocument.
 - Examples of implicit actions include ?OpenDocument, ?OpenView, and ?OpenDatabase.
 - If you do not specify an action, Domino defaults to the ?Open action.
- Append the Login argument to any Domino URL to require user authentication. Because URLs may not contain spaces, use the + (plus sign) as a separator. For example:

`http://www.testR5.com/discussion.nsf/By+Author`

- Separate arguments with & (ampersands). For example:
`http://www.testR5.com/leads.nsf/By+Salesperson?OpenView&ExpandView`
- Separate hierarchical names with / (slashes). For example, to open a view named Docs/By Author in a database named Discussion, enter:

`http://www.testR5.com/discussion.nsf/Docs/By+Author`

B.2 Opening servers, databases, and views

The following commands access servers, databases, views, about documents, help documents, and database icons.

OpenServer

Syntax:

`http://Host`

For example:

`http://www.testR5.com/?OpenServer`

OpenDatabase

Syntax:

`http://Host/DatabaseFileName?OpenDatabase`

`http://Host/DatabaseReplicaID?OpenDatabase`

Examples:

`http://www.testR5.com/leads.nsf?OpenDatabase`

`http://www.testR5.com/sales/discussion.nsf?OpenDatabase`

`http://www.testR5.com/852562F3007ABFD6?OpenDatabase`

OpenView

Syntax:

`http://Host/Database/ViewName?OpenView`

`http://Host/Database/$defaultview?OpenView`

Note

ViewName can be also an alias of the view.

Examples:

`http://www.testR5.com/leads.nsf/By+Salesperson?OpenView`

`http://www.testR5.com/leads.nsf/$defaultview?OpenView`

Arguments (Optional) - Append optional arguments to refine the URL.

Combine any of the following arguments for the desired result:

Start = n Where n is the row number to start with when displaying the view. The row number in a hierarchical view can include subindexes; for example, Start=3.5.1 means that the view will start at the third main topic, subtopic 5, document 1.

Count = n Where n is the number of rows to display.

ExpandView Displays the view in expanded format.

CollapseView Displays the view in collapsed format.

- Expand = n** Where n is the row number to display in expanded format in a hierarchical view. Do not combine this argument with the ExpandView or CollapseView0 arguments.
- Collapse = n** Where n is the row number to display in collapsed format in a hierarchical view. Do not combine this argument with the ExpandView or CollapseView arguments.
- StartKey = string** Open a view starting from the first document that matches the key. The key is selected on the first sorted column.

Examples:

```
http://www.test5.com/leads.nsf/By+Salesperson?OpenView&ExpandView
http://www.test5.com/leads.nsf/By+Salesperson?OpenView&Start=3&Count=15
```

Note

To open the first document in a view, use keyword \$First and the following syntax: `http://host/database/view/$First`

OpenAbout

Use the OpenAbout command to access the About database document.

Syntax:

```
http://Host/Database/$about?OpenAbout
```

Example:

```
http://www.testR5.com/leads.nsf/$about?OpenAbout
```

OpenHelp

Use the OpenHelp command to access the Help document.

Syntax:

```
http://Host/Database/$help?OpenHelp
```

Example:

```
http://www.testR5.com/leads.nsf/$help?OpenHelp
```

OpenIcon

Use the OpenIcon command to access the database icon.

Syntax:

```
http://Host/Database/$icon?OpenIcon
```


Example:

`http://www.testR5.com/leads.nsf/$icon?OpenIcon`

Login argument

Append the Login argument to any Domino URL to force user authentication, regardless of the database access control list. This ensures that anonymous Web users, who were not initially prompted for a name and password when they entered the site, are required to supply a name and password to complete tasks that require user identity.

Note

Do not use this argument to let a Web user switch login. In fact if a user has already logged in with a certain user ID and password, the login argument will be ignored. The only way to re-login as a new user is to close and then restart the browser.

Syntax:

You can use this argument with any URL, but the most common are:

`http://Host?OpenServer&Login`

`http://Host/Database?OpenDatabase&Login`

Examples:

`http://www.testR5.com?OpenServer&login`

`http://www.testR5.com/sales/leads.nsf?OpenDatabase&login`

B.3 Opening framesets, pages, forms, navigators, and agents

The following commands open framesets, pages, forms, navigators, and agents in a database.

OpenFrameset

Syntax:

`http://Host/Database/FramesetName?OpenFrameset`

Note

FramesetName can be also an alias of the frameset.

Example:

`http://www.testR5.com/products.nsf/Product?OpenFrameset`

OpenPage

Syntax:

`http://Host/Database/PageName?OpenPage`

Note

PageName can be also an alias of the page.

Example:

`http://www.testR5.com/products.nsf/Product?OpenPage`

OpenForm

Syntax:

`http://Host/Database/FormName?OpenForm`

`http://Host/Database/$defaultform?OpenForm`

Note

FormName can be also an alias of the form.

Examples:

`http://www.testR5.com/products.nsf/Product?OpenForm`

`http://www.testR5.com/products.nsf/$defaultform?OpenForm`

Arguments (Optional):

ParentUNID = The Universal ID of the parent document to respond to or to inherit from. Remember that if you are composing a response document or you want to inherit formulas from another document on the Web, you cannot select the parent document.

Syntax:

`http://Host/Database/FormUniversalID?OpenForm&ParentUNID`

Examples:

`http://www.testR5.com/products.nsf/40aa91d55cle4c8285256363004dc9e0?OpenForm&ParentUNID=6bc72a92613fd6bf852563de001f1a25`

Note

You can also use the ?OpenRead or ?ReadForm commands to open a form only in read mode. This is useful when you don't want to display the submit button.

OpenNavigator

Syntax:

```
http://Host/Database/NavigatorName?OpenNavigator  
http://Host/Database/$defaultNav?OpenNavigator
```

Examples:

```
http://www.testR5.com/products.nsf/Main+Navigator?OpenNavigator  
http://www.testR5.com/products.nsf/$defaultNav?OpenNavigator
```

Note

\$defaultNav opens the folder navigator in a database.

OpenAgent

Syntax:

```
http://Host/Database/Agentname?OpenAgent
```

Example:

```
http://www.testR5.com/sales/leads.nsf/Process+New+Leads?OpenAgent
```

B.4 Opening, editing, and deleting documents

The following commands manipulate documents in a database:

OpenDocument

Syntax:

```
http://Host/Database/View/DocumentKey?OpenDocument
```

`DocumentKey` contains the contents of the first sorted column in the specified view. For more information, see B.6, “Opening documents by key” on page 293.

Note

View is a necessary parameter because Domino uses the Form Formula of a view to determine the form to use when displaying the document (either using a Notes Client or a browser). If this formula is set to nothing, Domino uses the form written in the Form field of the document.

Example:

```
http://www.testR5.com/products.nsf/By+Part+Number/PC156?OpenDocument
```

EditDocument

Syntax:

`http://Host/Database/View/Document/?EditDocument`

Example:

`http://www.testR5.com/products.nsf/By+Part+Number/PC156?EditDocument`

DeleteDocument

Syntax:

`http://Host/Database/View/Document?DeleteDocument`

Example:

`http://www.testR5.com/products.nsf/By+Part+Number/PC156?DeleteDocument`

CreateDocument

The CreateDocument command is used as the POST action of an HTML form. When the user submits a form, Domino obtains the data entered in the form and creates a document.

Syntax:

`http://Host/Database/Form/?CreateDocument`

Example:

`http://www.testR5.com/products.nsf/part?CreateDocument`

SaveDocument

The SaveDocument command is used as the POST action of a document being edited. Domino updates the document with the new data entered in the form.

Syntax:

`http://Host/Database/View/Document?SaveDocument`

Example:

`http://www.testR5.com/products.nsf/a0cefa69d38ad9ed8525631b006582d0/4c95c7c6700160e2852563df0078cfef?SaveDocument`

B.5 Opening an anchor link

As seen in the previous section on Domino Links, a new syntax exists for opening a document at a specified area of its text.

Syntax:

`http://Host/Database/View/Document?OpenDocument#AnchorLabel`

Example:

`http://localhost/RedBook.nsf/66aa0bd809ee8316852564d8004e7ddc/503d4e
e771078042852564e400598a8e?OpenDocument#Paragraph+3`

The Anchor label is created when you build the anchor inside the linked document. If no name has been entered for that link, a default number is added, for example, `#_0`.

B.6 Opening documents by key

The following commands allow you to open a document by key, or to generate a URL to link to a document by key.

Using Domino URLs to access a document

To open a document by key, create a sorted view with the sort on the first key column. You then can use a URL to open the document.

Syntax:

`http://Host/DatabaseName/View/DocumentName?OpenDocument`

Example:

`http://www.testR5.com/register.nsf/Registered+Users/Jay+Street?OpenD
ocument`

Where `View` is the name of the view and `DocumentName` is the string, or key, that appears in the first sorted or categorized column of the view. Use this syntax to open, edit, or delete documents and to open attached files.

Domino returns the first document in the view with a column key that exactly matches the `DocumentName`.

There may be more than one matching document; Domino always returns the first match. The key must match completely for Domino to return the document. However, the match is not case-sensitive or accent-sensitive.

Note that the view can be a view Notes ID, UNID, or view name. In addition, the implicit form of any of these commands will work when appropriate (`EditDocument` and `DeleteDocument` must be explicit commands).

B.7 Advantages of using keys instead of Universal ID

Let's suppose that the following two URLs refer to the same document, which is the personal document of Jay Street, for example:

```
http://www.testR5.com/register.nsf/Registered+Users/Jay+Street?OpenDocument
http://www.testR5.com/register.nsf/a0cefa69d38ad9ed8525631b006582d0/4c95c7c6700160e2852563df0078cfef?OpenDocument
```

The first URL is, of course, much more understandable than the second URL and, therefore, easier to remember. However, this is not the only advantage of using keys to refer to Domino objects.

Imagine that the Jay Street document has been deleted and replaced by a new copy. The reasons for using this event might be, for example, where all documents of that kind are deleted and rebuilt every night by an agent that takes updated data from an external data source. In this situation, the first URL continues to reference the Jay Street document, while the second URL fails because the Universal ID of the new document will be different from the former. This means that if a user has stored the first URL as a bookmark he or she will have no problem finding this document again and so will avoid repeated searches.

However, you should also consider the following implications of using URL by keys:

- A developer must use @formulas to calculate every URL using keys and must hide or inhibit all the URLs automatically generated by Domino. This means that you do not need to copy and paste links to Domino objects.
- The access to documents is faster when using Universal ID than using keys, as the server must read the view index to reach the document when using keys.

B.8 Opening image files, attachments, and OLE objects

The following commands open files and objects within a document:

OpenElement

Use the ?OpenElement command to access file attachments, image files, and OLE objects. This is very useful when writing passthru HTML; for example, when you need to display an image that is attached into another Notes document, you can use the URL described here.

Using OpenElement with file attachments

Syntax:

```
http://Host/Database/View/Document/$File/Filename?OpenElement
```

```
http://Host/Database/View/Document/$File/InternalFileName/Filename?OpenElement
```

Example:

```
http://www.testR5.com/lproducts.nsf/By+Part+Number/SN156/$File/spec.txt?OpenElement
```

If more than one attached file has the same name, the URL includes both the internal file name as well as the external name. Since the internal file name is not easily determined, make sure that all attached files have unique names.

Domino treats all file attachment OpenElement commands as implicit commands, because some browsers require that the URL ends with the attached file name.

Using OpenElement with image files

This is used to retrieve an image that is an imported image into a Notes field.

Syntax:

```
http://Host/Database/View/Document/FieldName/FieldOffset?OpenElement&FieldElemFormat=ImageFormat
```

FieldOffset is represented by xx.yy, where xx is the field number, and yy is the byte offset into the field.

ImageFormat is either GIF or JPEG. If the FieldElemFormat is not entered, Domino assumes that the image file format is GIF.

To see an example, try to import a GIF image into a rich text field and launch the preview in browser. Next, look at the HTML source for that image. You should find something like this:

```
<IMG SRC="/database/view/document/FieldName/xx.yy?OpenElement&FieldElemFormat=GIF">
```

Using OpenElement with OLE objects

Syntax:

```
http://Host/Database/View/Document/FieldName/FieldOffset/$OLEOBJINFO/FieldOffset/obj.ods?OpenElement
```

Note

The current URL syntax for referencing images and objects in Notes documents — specifically the FieldOffset — makes it impractical to create these URLs manually. As an alternative, you may paste the actual bitmap or object in place of the reference, create URL references to files stored in the file system, or attach the files to the documents.

B.8.1 Searching for text with Domino search URLs

The following commands allow you to search a Domino site or to search individual databases within a Domino site.

SearchSite

Syntax:

```
http://Host/Database/[$SearchForm]?SearchSite[ArgumentList]
```

Where `$SearchForm` and `ArgumentList` are optional arguments. The special identifier `$SearchForm` indicates that Domino will present a search site form for search input. If this identifier is provided, `ArgumentList` is ignored.

Examples:

```
http://www.testR5.com/mercsrch.nsf/$SearchForm?SearchSite
http://www.testR5.com/mercsrch.nsf/?SearchSite&Query=product+info+re
quests;1;;0;FALSE
```

SearchView

Syntax:

```
http://Host/Database/View/[$SearchForm]?SearchView[ArgumentList]
```

Where `$SearchForm` and `ArgumentList` are optional arguments.

The special identifier `$SearchForm` indicates that Domino will present a search view form for search input. If this identifier is provided, the `ArgumentList` is ignored.

Examples:

```
http://www.testR5.com/products.nsf/By+Product+Number/$SearchForm?SearchView
http://www.testR5.com/products.nsf/By+Product+Number/?SearchView&Query=PC156;3;
;0;TRUE;
```

Arguments (Optional)

`ArgumentList` = Query, SearchOrder, SearchThesaurus, SearchMax, SearchWV

Where:

- Query = the search string
- SearchOrder=[1,2,3] default = 1.
 - 1 = By Relevance
 - 2 = By Date Ascending
 - 3 = By Date Descending
- SearchThesaurus=[TRUE, FALSE], default = FALSE
- SearchMax=[n], 0 default= 0 (meaning all)
- SearchWord Variants=[TRUE, FALSE], default = TRUE
The ArgumentList must contain the Query argument; in addition, it may contain any or all of the other arguments.
- OldSearchQuery
Repeats the last query.

Appendix C. Problem determination

Most of the information that you need to do problem determination is already described in “Troubleshooting” in the online documentation *Domino Release 5, Administering the Domino System Volume 2*. This appendix provides information you especially need for the OS/2 environment. If you need general guidance for troubleshooting for Domino systems, please refer above book first.

If you need network-related troubleshooting, please refer to “Appendix B. Troubleshooting Network Problems” in *Domino Release 5, Configuring the Domino Network*.

C.1 Problem determination for the OS/2 operating system

When a problem happens, the important thing you have to do first is collect all the necessary information to help the investigation of the problem. This section provides introductory information about important files and tools for problem determination.

C.1.1 Important files for OS/2 system problem determination

If you have a problem on an OS/2 system, the following files will be helpful files for problem determination. Please make sure to keep these files for further investigation.

- d:\config.sys
- d:\startup.cmd
- d:\ibmcom\protocol.ini
- d:\ibmlan\ibmlan.ini
- d:\ibmcom\lantran.log
- d:\popupos2.log
- d:\domino\data\notes.rip
- d:\domino\notes.ini
- syslevel command output

The lantran.log and notes.rip files are overwritten. You have to change the file name to keep the information written in the files.

C.1.2 Important tools for OS/2 system problem determination

OS/2 system has powerful tools for problem determination, including:

- pstat.exe — Process monitor

- pulse.exe, mpcpumon.exe — Display CPU usage and control
- Netfinity V5 software — Popular system management tool
- trace.exe — OS/2 system trace utility
- System Performance Monitor/2 — Performance monitor
- Stand-alone dump utility
- FFST for OS/2 — Capture tool for error information
- Kernel debugging for advanced problem diagnosis — Debugger

For more information about these tools and there use, please refer online command references or *The OS/2 Debugging Handbook - Volume I*, SG24-4640.

C.1.3 Domino OS/2 server crashes

If an OS/2 server crashes, a message resembling the following appears:

```
Trap 000C Internal Processing error at Location # nnn:nnn
Trap 000D CS= nnnn IP= nn xxxxx
CSLIM = nnnn
```

Where nnnn represents error locations and addresses.

Crashed network drivers or an OS/2 problem may cause this error. Record the addresses and report them to your network administrator. Then restart the server.

When an OS/2 server crashes, the console displays an error code. Record the code.

Table 28. Codes that display when an OS/2 server crashes

Code	Meaning	Cause
0	Divide error	The software is bad.
1	Debug exceptions	The software is bad. Record all addresses.
2	NMI interruption	Stands for non-maskable interrupt. The software is bad. Record all addresses.
3	Breakpoint	There is a software problem. Record all addresses.
4	Overflow	The software is bad. Record all addresses.
5	Bound range exceeded	There is a software problem. Record all addresses.
6	Invalid opcode	There is a software problem. Record all addresses.

Code	Meaning	Cause
7	Co-processor not available	The software is expecting a math co-processor, and one isn't installed.
8	Double fault	Two traps occurred at the same time. Record all addresses.
9	Co-processor segment overrun	There is a software problem. Record all addresses.
A/10	Invalid task state segment	There is a software problem. Record all addresses.
B/11	Segment not present	There is a software problem. Record all addresses.
C/12	Stack exception	There is a software problem. Ignore this code if it follows a code D/13.
D/13	General protection	There is a software problem or a corrupted database.
D/15	Co-processor error	There is a bad co-processor chip.

C.1.3.1 The notes.rip file

Use the notes.rip files to help you determine the cause of a server or workstation crash. A program called QNC (qnc.exe), pronounced quincy, creates these files in the Domino data directory (for a server) or in the Notes data directory (for a workstation). The files contain information about the tasks the server was running when it crashed. Each task, for example, Replica, Router, and Update, is started by a separate instance of QNC. If one of these tasks crashes, the QNC program for the task produces a notes.rip file.

C.1.4 Other references

See Appendix G, "Related publications" on page 321 to find redbooks that could be of help for problem determination.

C.2 Problem determination for a network

If you have a communication problem between any server or clients, this might be a network-related problem. For problem determination, which the following items:

1. Identify which protocol is not available.
2. Check if the hardware is working correctly.
3. Check if the network interface card driver is working correctly.

4. Check if MPTS is correctly configured.
5. Check if the IBMLAN software is working correctly.
6. Check if the Domino R5 port driver is working correctly.
7. Check if the name resolution environment is properly configured.

C.2.1 Important files for network problem determination

If you have a network-related problem, please make sure you have copies of these files for further investigation:

- d:\config.sys
- d:\startup.cmd
- d:\ibmcom\protocol.ini
- d:\ibmlan\ibmlan.ini
- d:\ibmcom\lantran.log
- d:\domino\notes.ini
- d:\mptn\etc\host
- d:\mptn\etc\resolv2
- ifconfig output

C.2.2 Important tools for network problem determination

Following is a list of tools for network-related problem determination:

- ping — IP connection confirmation
- ifconfig — LANx interface configuration
- netstat — TCP/IP configuration confirmation
- tracert — TCP/IP routing problem helper
- nslookup — TCP/IP name resolution confirmation
- dadmin — Dynamic IP environment admin tool
- iptrace, ipformat — TCP/IP network traffic trace
- os2tracemask parameter in protocol.ini file — Trace mask for OS/2 system trace utility
- network analyzer — Any tool, for example, DatagLANce, Sniffer, Observer, and so forth

For more information about these tools and their use, please refer to the online command manual or references included in the product package.

C.2.3 Other references

If you need more information, the following materials may be helpful:

- *Domino Release 5, Configuring the Domino Network*
- *Understanding Performance Tuning Theory for IBM OS/2 LAN Server*, GG24-4430
- *Network Clients for OS/2 Warp Server: OS/2 Warp4, DOS/Windows, Windows 95/NT, and Apple Macintosh*, SG24-2009
- *Beyond DHCP – Work Your TCP/IP Internetwork with Dynamic IP*, SG24-5280

C.3 Problem determination for the Domino server

Most of the information you need is already described in the troubleshooting chapter in the online documentation *Domino Release 5, Administering the Domino System Volume 2*. This section introduces some convenient tools to help with problem determination.

C.3.1 Tracing network connections

To test whether you can connect to a server, use the Trace Connection feature. Results of a Trace Connection provide detailed information about the steps involved when connecting to a server and are useful in troubleshooting network connection problems. When you attempt to connect to a server, network trace information automatically appears on the status bar of a Notes workstation or on the server console, depending on where you initiated the connection attempt. You can use the notes.ini Console_LogLevel setting to control the level of detail that messages on the status bar contain.

To trace a connection, you can enter this command at the console:

```
Trace servername
```

For more information, see the Appendix “Server Commands” in *Domino Release 5, Administering the Domino System Volume 2*. You can display information on how a server makes a connection by viewing the information in the Miscellaneous Events view in the log file (log.nsf). You can change the amount of information about the connection recorded in the log file by changing the log level.

If you have a problem connecting to a server from a Notes workstation, you can use the trace function for problem determination.

1. From the Notes workstation program, choose **File => Preferences => Notes Preferences => Ports**.
2. Highlight the protocol/port you want to analyze.

3. Select **Trace Connection**.
4. Specify the server you want to connect to.
5. Select **Trace**.

Note

Enable the log options to Full Trace to enter information into the log file.

C.3.2 How servers make a connection

You can make a connection to a server from either a workstation or another server; the method for determining the path is similar whether you use a workstation or server. Knowing this logic might be helpful to identify network related problem source.

A server uses this logic to determine how to connect to another server:

1. The connecting server tries to connect using the same method it used the last time it made a successful connection to the destination server.

Note these two exceptions: If the server never connected to the destination server, the server searches for a path (consisting of a network port and any passthru servers) to the destination server. If the server has connected previously, but the connection now fails, the server conducts a new path search if it is the first attempt of the day.

2. In searching for the destination server path, the connecting server performs these actions:
 - The server checks to see if it is already has a WAN port connection to the destination server.
 - The server examines normal-priority Connection documents in the Domino Directory for Connection information (to find a path to the destination server). A normal-priority Connection document is one that has Normal selected in the Usage priority field.
 - If multiple normal-priority Connection documents exist for the same destination server, the server uses Connection documents in this following order (based on their Connection type):
 - Local Area Network
 - Network Dialup
 - Notes Direct Dialup
 - Passthru server
 - Hunt Group of passthru servers

- If the server uses a passthru Connection document, then Notes must be able to find a path to the passthru server. You can use a Connection document (Local Area Network, Network Dialup, Notes Direct Dialup, Passthru, or Hunt Group) to define this path.
3. The connecting server checks information stored in memory about other servers in the server's Notes named network. It uses this information to define a path to the destination server. The server reads this information from Server documents in its local Domino Directory.
 4. If the connecting server's local Domino Directory does not contain information about the destination server, it tries to connect directly to the destination server on the LAN by using the server common name as its address.
 5. The connecting server checks the low-priority Connection documents. A low-priority Connection document is one in which Low is selected in the Usage priority field.
 6. If the connecting server still cannot find a path to the destination server, it issues a message that a connection is not possible.

Note

For workstations connecting to servers, the search logic is the same except that the workstation tries to use the passthru server listed as default in the Location document to make the connection if Steps 1 through 5 fail. If the Location document does not define a default passthru server, and the workstation is already connected to a server over a Notes Direct Dial up connection, the workstation uses that server as a passthru to reach the destination server.

Appendix D. Using Lotus Notes R4.6 Client on OS/2

This appendix shows you installation tips for Notes R4.6 on OS/2.

D.1 The Notes R4.6 Client

This Client is provided for Domino server administration purposes only. If you change the installation configuration file, you can install Notes R4.6 Client for OS/2 as well. However, this Client is not officially supported.

Do not install the R4.6 Client on a R5 server.

D.2 How to install Notes R4.6

To install Notes R4.6 Client, which is not the administration client included with the server, follow the instructions below:

1. Copy the contents of the directory `server\os2\install` (and subdirectories) from the CD-ROM to a temporary directory on your hard drive (so you can edit and save some text files).
2. In the temporary install directory:
 - Edit the `p32wrk.pkg` file and change the line `DISPLAY='NO'` to `DISPLAY='YES'`
 - Edit the `notes.ini` file and add the line `UNSUPPORTEDCLIENT=1.`
3. Run `instpm.exe`. Go through the custom server install. You will now see `WORKSTATION` listed in the modules you can install.
4. Once the installation is completed and you've rebooted, go into the `notes.ini` in the `\notes\data` directory and do the following:
 - Change the line `KitType=2` to `KitType=1.`
 - Rename the `Domino Server Administration` icon to `Lotus Notes 4.6.1.`
5. Click the icon and set up the Client.

All the functions of the Notes Designer 4.6.1 should be present.

If you have a server already installed, and you want the Notes Client on the same machine, just edit the `p32wrk.pkg` file and change the line `DISPLAY='NO'` to `DISPLAY='YES'` and edit the `notes.ini` file and add the line `UNSUPPORTEDCLIENT=1.`

To have access to the Domino Server Administration from the Notes Client, access the menu and select **File => Tools => Server administration**.

Appendix E. Enabling Lotus Notes on WorkSpace On-Demand 2.0

These instructions include information on how to install and configure Lotus Notes as a Public Application for WorkSpace On-Demand clients.

E.1 Roadmap for installing and configuring Lotus Notes

The following list describes the steps to install and configure Lotus Notes for WorkSpace On-Demand 2.0:

1. Verify that you fulfill all of the prerequisites.
2. Install Lotus Notes.
3. Configure Lotus Notes on the server.
4. Configure Lotus Notes on a client.
5. Configure Lotus Notes for additional users.

E.2 Prerequisites

The following are prerequisites:

- Install and configure the WorkSpace On-Demand 2.0 server and clients.
- Install and configure the Domino R5 server.
- Create a user account on the domain controller for the Lotus Notes installation. For example, create a user account called Inuser.
- Access to the domain controller must be available from the boot (RIPL) server.

E.3 Installing Lotus Notes

To install Lotus Notes, you must first perform a shared installation, and then you must perform a local node installation. Perform both of these installations on a WorkSpace On-Demand server.

E.3.1 Server installation

To install the server, do the following:

1. Insert the Lotus Notes CD into the CD-ROM drive.
2. At a command prompt, change to the CD-ROM drive letter and change to the OS2\INSTALL directory.

3. Type `INSTPM`.
4. Click **Shared Installation** and click **Continue**.
5. Deselect the check box for updating CONFIG.SYS.
6. Select the components you want to install.
7. In the Notes Directory field, type:
`d:\IBMLAN\RPL\nOTES`
 Where `d` represents the drive letter where the RPL tree resides.
8. Click **Install**.

E.3.2 Local node installation

Complete the following steps:

Note

If your RIPL server is not also a domain controller, connect to the drive on the domain controller where the DCDB directory resides. (Some of the installation output is written to the USER directory on the domain controller.)

1. At a command prompt, change to the directory `d:\IBMLAN\RPL\nOTES`.
`d` represents the drive letter where the RPL tree resides.
2. Type `EPFIDLDS`.
3. Click **Node installation** and click **OK**.
4. Deselect the check box for updating CONFIG.SYS.
5. Click **Notes Data**.
6. In the Notes Directory field, type:
`d:\IBMLAN\RPL\nOTES`
 In the Notes Data Directory field, type:
`f:\IBMLAN\DCDB\USERS\lnuser\UNOTES`
`d` represents the drive letter where the RPL tree resides.
`f` represents the drive letter where the DCDB directory resides.
`lnuser` represents the user ID you created for Lotus Notes.
7. After the installation completes, in any ASCII text editor, open the file:
`f:\IBMLAN\DCDB\USERS\lnuser\UNOTES\nOTES.INI`

`f` represents the drive letter where the DCDB directory resides.

`lnuser` represents the user ID you created for Lotus Notes.

8. Change the statement `directory = to directory = Z:\NOTES\DATA`, then save your changes.

`z:` represents the client's boot drive.

9. Copy the Lotus Notes ID file for `lnuser` to the directory,

`f:\IBMLAN\DCDB\USERS\lnuser\UNOTES`

`f` represents the drive letter where the DCDB directory resides.

`lnuser` represents the user ID you created for Lotus Notes.

E.4 Configuring Lotus Notes on the WorkSpace On-Demand server

To configure Lotus Notes for WorkSpace On-Demand 2.0 you must edit the FIT files and create a Lotus Notes Public Application.

E.4.1 Editing FIT files

To edit FIT files, do the following:

1. On the WorkSpace On-Demand domain controller, in any ASCII text editor, open the default user FIT file:

`f:\IBMLAN\DCDB\BB20USDU.FIT`

`f` represents the drive letter where the DCDB directory resides.

2. Add the following statements to the end of the file:

`Z:\NOTES\DATA \\<DCSERVER>\IBMLAN$\DCDB\USERS\<USER>\UNOTES`

`Z:\NOTES\NOTES.INI`

`\\<DCSERVER>\IBMLAN$\DCDB\USERS\<USER>\UNOTES\NOTES.INI`

`z` represents the client's boot drive.

3. In any ASCII text editor, open the file `d:\IBMLAN\RPL\FITS\DFB20US.FIT`

`d` represents the drive letter where the RPL tree resides.

Note

To run Lotus Notes on only one client, do not edit DFB20US.FIT, instead edit the FIT file for that client.

4. Add the following statement to the end of the FIT file:

`Z:\NOTES \\rplsrvr\RPLFILES\NOTES`

rplsrvr represents the name of the RIPL server.
z represents the client boot drive.

E.5 Creating a Lotus Notes Public Application

To create a Notes Public Application, do the following:

1. Log on the WorkSpace On-Demand server as an administrator.
2. Double-click **Lan Server Administration**.
3. Double-click the domain folder, and double-click **Public Application Definitions**.
4. Drag and drop the **WorkSpace On-Demand** template in another location in the folder.
5. Click the **Identity** tab and fill in the following information:

Application name: NOTES (You can use any name for this value.)

Description: Lotus Notes R4.57. (Type a description that is meaningful to you in this field.)

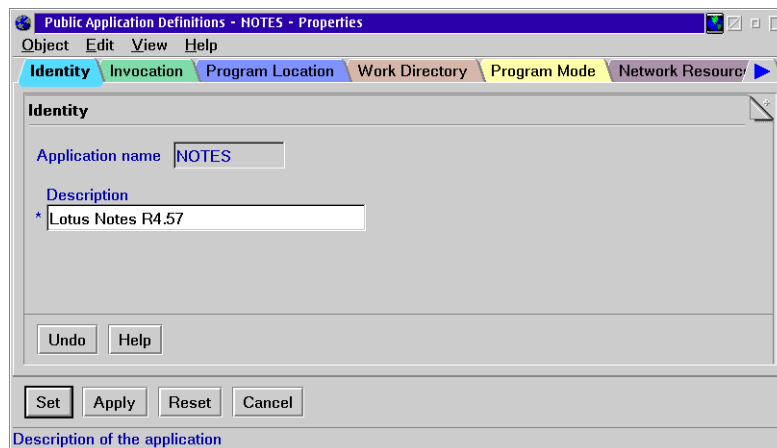


Figure 110. LAN Server Public Application: Identity tab

6. Click the **Invocation** tab and fill in the following information:
Command: NOTES.EXE

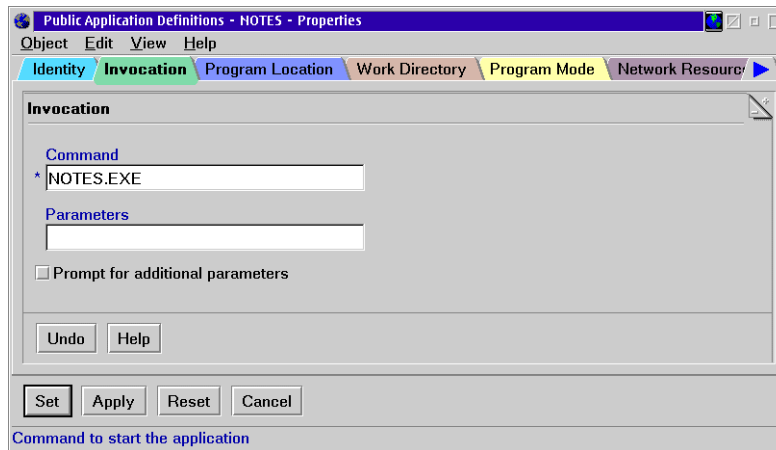


Figure 111. LAN Server Public Application: Invocation tab

7. Click the **Program Location** tab and fill in the following information:

Program location: **On requester**

Drive: **z:** (your client boot drive)

Remaining path: **\NOTES**

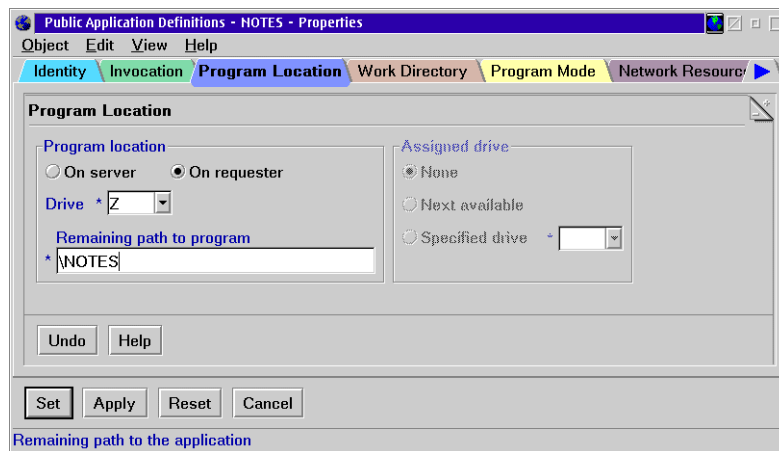


Figure 112. LAN Server Public Application: Program Location tab

8. Click the **Parameters** tab and click the **Add** button to add the following PATH, LIBPATH, and application parameters:

PATH Z:\NOTES Begin

LIBPATH Z:\NOTES;Z:\NOTES\DATA Begin

WSOD_LAUNCH_MINIMIZED Begin
WSOD_LAUNCH_NODROP Begin

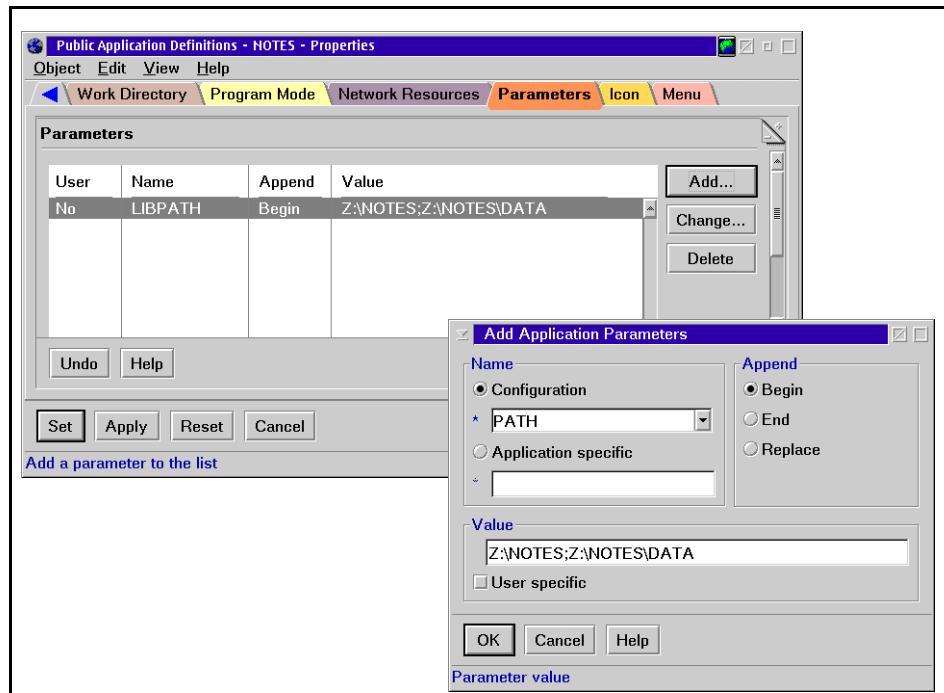


Figure 113. LAN Server Public Application: Parameters tab

9. Click **Set**.
10. Assign the Lotus Notes Public Application to the user account that you created for Lotus Notes. For example, assign the application to *Inuser*.

E.6 Configuring Lotus Notes on a client

To configure Notes on a client, do the following:

1. Start a WorkSpace On-Demand 2.0 client.
2. Log on the client with the user account that you created for Lotus Notes. For example, log on with the user account *Inuser*.
3. Double-click the **Lotus Notes** icon.
4. Customize the Lotus Notes application.

This should enable you to access your Domino R5 server from this WorkSpace On-Demand 2.0 client.

E.7 Configuring Lotus Notes for additional users

To configure Notes for additional users, do the following:

1. Log on the WorkSpace On-Demand 2.0 server as an administrator.
2. Create a UNOTES subdirectory in the \IBMLAN\DCDB\USERS directory of each user account that you want to assign Lotus Notes. For example, for the user USER1, create the directory, d:\IBMLAN\DCDB\USERS\USER1\UNOTES.
3. Change to the d:\IBMLAN\DCDB\USERS\lnuser\UNOTES directory.
lnuser represents the user ID you created for Lotus Notes.
4. XCOPY the subdirectories and files from this directory to the UNOTES subdirectory for each user account. For example, at a command prompt, type:

```
XCOPY * d:\IBMLAN\DCDB\USERS\USER1\UNOTES /S /E /T /H
```

5. Change to the UNOTES subdirectory for each user account and delete the following files:
 - NAMES.NSF
 - CACHE.DSK
 - DESKTOP.DSK
 - CLUSTER.NCF
 - JOBSCHED.NJF
 - ID file for lnuser

lnuser represents the user ID you created for Lotus Notes.

6. Copy the Lotus Notes ID file for each user account into that user's UNOTES subdirectory. For example, copy the ID file for USER1 to the directory, d:\IBMLAN\DCDB\USERS\USER1\UNOTES.
7. For every user account, change to the UNOTES subdirectory and open the file notes.ini in any ASCII text editor.

Remove any lines below the statement `KitType=1`. The file should contain only the following lines:

```
[Notes]
Directory=z:\NOTES\DATA
KitType=1
```

8. Assign the Lotus Notes Public Application to each user account.

Appendix F. Special notices

This publication is intended to help Lotus Domino server administrators to install, setup, and administer Lotus Domino R5 in OS/2 environment, especially in a mixed environment with previous versions of Notes R4.x clients. The information in this publication is not intended as the specification of any programming interfaces that are provided by Lotus Domino R5. See the PUBLICATIONS section of the IBM Programming Announcement for Lotus Domino R5 for more information about what publications are considered to be product documentation.

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Appendix G. Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

G.1 IBM Redbooks publications

For information on ordering these publications see “How to get IBM Redbooks” on page 325.

Domino-related IBM Redbooks

- *Connecting Domino to the Enterprise Using Java*, SG24-5425
- *Eight Steps to a Successful Messaging Migration: A Planning Guide for Migrating to Lotus Notes and Domino*, SG24-5335
- *High Availability and Scalability with Domino Clustering and Partitioning on Windows NT*, SG24-5141
- *Lotus Domino R5 on IBM RS/6000: Installation, Customization, and Administration*, SG24-5138
- *Lotus Domino for AS/400: Integration with Enterprise Applications*, SG24-5345
- *Lotus Domino Release 5.0: A Developer's Handbook*, SG24-5331
- *Lotus Notes and Domino R5.0 Security Infrastructure Revealed*, SG24-5341
- *Netfinity and Domino R5.0 Integration Guide*, SG24-5313
- *The Next Generation in Messaging: Moving from MS Mail to Lotus Notes and Domino*, SG24-5152

OS/2 Warp family-related IBM Redbooks

- *Beyond DHCP – Work Your TCP/IP Internetwork with Dynamic IP*, SG24-5280
- *OS/2 Warp Server for e-business*, SG24-5393
- *Inside OS/2 Warp Server, Volume 1: Exploring the Core Components*, SG24-4602
- *Inside OS/2 Warp Server, Volume 2: System Management, Backup/Recovery and Advanced Print Services*, SG24-4702
- *Migrating to OS/2 Warp Server for e-business*, SG24-5135

- *Network Clients for OS/2 Warp Server: OS/2 Warp4, DOS/Windows, Windows 95/NT, and Apple Macintosh*, SG24-2009
- *OS/2 Warp Server Functional Enhancements, Part 1*, SG24-2008
- *The OS/2 Debugging Handbook - Volume I*, SG24-4640
- *Understanding Performance Tuning Theory for IBM OS/2 LAN Server*, GG24-4430
- *WorkSpace On-Demand Handbook Release 2.0*, SG24-5117
- *WorkSpace On-Demand Early Customer Experiences*, SG24-5107
- *WorkSpace On-Demand 2.0 Feature for Windows Clients*, SG24-5396

Other IBM Redbooks

- *Managing Domino/Notes with Tivoli Manager for Domino Enterprise Edition*, SG24-2104

G.2 IBM Redbooks collections

Redbooks are also available on the following CD-ROMs. Click the CD-ROMs button at <http://www.redbooks.ibm.com/> for information about all the CD-ROMs offered, updates and formats.

CD-ROM Title	Collection Kit Number
System/390 Redbooks Collection	SK2T-2177
Networking and Systems Management Redbooks Collection	SK2T-6022
Transaction Processing and Data Management Redbooks Collection	SK2T-8038
Lotus Redbooks Collection	SK2T-8039
Tivoli Redbooks Collection	SK2T-8044
AS/400 Redbooks Collection	SK2T-2849
Netfinity Hardware and Software Redbooks Collection	SK2T-8046
RS/6000 Redbooks Collection (BkMgr)	SK2T-8040
RS/6000 Redbooks Collection (PDF Format)	SK2T-8043
Application Development Redbooks Collection	SK2T-8037
IBM Enterprise Storage and Systems Management Solutions	SK3T-3694

G.3 Other resources

These publications are also relevant as further information sources:

From the Notes.net Web site, <http://notes.net/notesua.nsf/r5?openview>, you can get PDF version of the following documentation:

- *Domino Release 5, Administering Domino Clusters*
- *Domino Release 5, Administering the Domino System Volume 1, CT6T7NA*
- *Domino Release 5, Administering the Domino System Volume 2, CT6T8NA*
- *Domino Release 5, Configuring the Domino Network*
- *Domino Release 5, Managing Domino Databases*
- *Domino Release 5, Moving to Notes and Domino Release 5*
- *Domino Release 5, Setting Up a Domino Server*
- *Optimizing server performance*
- *Notes, Domino and Domino Designer Release 5, Release Notes*
- *Maximizing Application and Server Performance in Domino*, January 1999, A Lotus Development Corporation White Paper

From the Lotus.com Web site, <http://www.lotus.com/services/education.nsf>, you can purchase R5 Reference Books (Lotus Yellowbooks) of the documentation mentioned above.

G.4 Referenced Web sites

These Web sites are also relevant as further information sources:

- <ftp://ftp.hursley.ibm.com/pub/java/fixes/os2/11/118>
- <ftp://ftp.lotus.com/pub/lotusweb/product/domino/domperform/maxperformancedomino.pdf>
- <ftp://ftp.software.ibm.com/ps/products>
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List of abbreviations

ACL	Access Control List	DNS	Domain Name System
APAR	Authorized Program Analysis Report	DOS	Disk Operating System
API	Application Program Interface	DRS	Domino Runtime Services
ASCII	American National Standard Code for Information Interchange	DRT	Delivery Report Task
AT	ATtention (command set used with asynchronous modems)	DSAPI	Domino Webserver API
BIDI	Bidirectional	FAT	File Allocation Table
CDSA	Common Data Security Architecture	FTP	File Transfer Protocol
CGI	Common Gateway Interface	FTPD	FTP Daemon
CORBA	Common Object Request Broker Architecture	GB	Gigabytes
CPU	Central Processing Unit	GEM	Global Enterprise Manager
CRC	Cyclic Redundancy Check	GDT	Global Descriptor Table
CSD	Corrective Service Diskette	GIF	Graphical Interchange Format
DASD	Direct Access Storage Device	HPFS	High Performance File System
DDNS	Dynamic DNS	HTML	Hypertext Markup Language
DECS	Domino Enterprise Connection Services	HTTP	Hypertext Transfer Protocol
DHCP	Dynamic Host Configuration Protocol	HTTPS	HTTP Secured
DHTML	Dynamic HTML	IBM	International Business Machines Corporation
DLL	Dynamic Link Library	ICM	Internet Cluster Manager
DMA	Directory Memory Access	IEEE	Institute of Electrical and Electronics Engineers
		IFS	Installable File System
		IIOF	Internet Inter-ORB Protocol
		IIS	Internet Information Server
		IMAP	Internet Message Access Protocol

IMAP4	IMAP Version 4	MPTS	Multiple Protocol Transport Services
IOCP	I/O Control Program	MSCS	Microsoft Cluster Server
IPX	Internetwork Packet eXchange	MTA	Message Transfer Agent
ISDN	Integrated-Service Digital Network	NetBIOS	Network Basic Input/Output System
ITSO	International Technical Support Organization	NetBEUI	NetBIOS Extended User Interface
JFS	Journalized File System	NFS	Network File System
JIT	Just In Time	NIC	Network Interface Card
JPEG	Joint Photographic Experts Group	NIF	Notes Index File
JRE	Java Runtime Environment	NNTP	Network News Transfer Protocol
JSDK	Java Servlet Development Kit	NRPC	Notes RPC
JVM	Java Virtual Machine	NTFS	NT File System
KB	Kilobytes	ODS	On Disk Structure
KEE	Kernel Execution Environment	OLE	Object Linking and Embedding
LAN	Local Area Network	ORB	Object Request Broker
LAPS	LAN Adapter Protocol Support	OU	Organization Unit
LDAP	Lightweight Directory Access Protocol (RFC 1823)	PAB	Public Address Book
LDIF	LDAP Data Interchange Format	PCI	Peripheral Component Interconnect
LPD	Line Printer Daemon	PDA	Personal Digital Assistant
LSN	Local Session Number	PDF	Portable Document Format
LVM	Logical Volume Manager	PMX	Presentation Manager Xwindows
MAPI	Mail API	POP3	Post Office Protocol Version 3
MB	Megabytes	QMR	Quarterly Maintenance Release
MHz	Megahertz	RAID	Redundant Array of Inexpensive Disks
MIME	Multipurpose Internet Mail Extensions (RFC 1344)	RAM	Random Access Memory
		RAS	Reliability, Availability, and Serviceability

<i>RFC</i>	Request for Comment	<i>WAN</i>	Wide Area Network
<i>RPC</i>	Remote Procedure Call	<i>WSOD</i>	WorkSpace On-Demand
<i>RSA</i>	Rivest-Shamir-Adleman Algorithm	<i>Y2K</i>	Year 2000
<i>RSU</i>	Remote Service Update		
<i>SCOS</i>	Single Copy Object Store		
<i>SCSI</i>	Small Computer System Interface		
<i>SLA</i>	Service Level Agreement		
<i>S/MIME</i>	Secure MIME		
<i>SMP</i>	Symmetric Multiprocessor		
<i>SMTCP</i>	Simple Message Tracker Collector Protocol		
<i>SMTP</i>	Simple Mail Transfer Protocol		
<i>SPX</i>	Sequenced Packet eXchange		
<i>SSL</i>	Secure Sockets Layer		
<i>TCP/IP</i>	Transmission Control Protocol/Internet Protocol		
<i>TFTP</i>	Trivial FTP		
<i>TFTPD</i>	TFTP Daemon		
<i>TMR</i>	Tivoli Management Region		
<i>UBE</i>	Unsolicited Bulk E-mail		
<i>UBM</i>	Unified Buffer Manager		
<i>UCE</i>	Unsolicited Commercial E-mail		
<i>UNC</i>	Universal Naming Convention		
<i>UPO</i>	Upgrade Protection Option		
<i>URL</i>	Universal Resource Locator		
<i>VPN</i>	Virtual Private Network		

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